

# Gastroenterologist and Patient Attitudes Toward Yoga as a Therapy for Irritable Bowel Syndrome: An Application of the Theory of Planned Behaviour

Adrijana D'Silva, MHS<sup>1</sup>, Deborah A. Marshall, PhD<sup>1,2</sup>, Jeff K. Vallance, PhD<sup>3</sup>, Yasmin Nasser, MD, PhD<sup>4,5</sup>, Lorian M. Taylor, PhD<sup>1</sup>, Adriana Lazarescu, MD<sup>6</sup>, Maitreyi Raman, MD<sup>1,4,5</sup>

<sup>1</sup>Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada;

<sup>2</sup>Arthur J.E. Child Chair, Department of Medicine, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada;

<sup>3</sup>Faculty of Health Disciplines, Athabasca University, Athabasca, Alberta, Canada;

<sup>4</sup>Division of Gastroenterology and Hepatology, Department of Medicine, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada;

<sup>5</sup>Snyder Institute for Chronic Diseases, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada;

<sup>6</sup>Division of Gastroenterology, Department of Medicine, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alberta, Canada

Correspondence: Maitreyi Raman, MD, Faculty of Medicine, University of Calgary, 6D33 TRW Building, 3280 Hospital Drive NW, Calgary, Alberta, T2N 4Z6, Canada, e-mail: [mkothand@ucalgary.ca](mailto:mkothand@ucalgary.ca)

## Abstract

**Objectives:** To identify irritable bowel syndrome (IBS) patients' attitudes, subjective norms, perceived control and intention to practice yoga and gastroenterologists' attitudes and current yoga recommendations for their patients with IBS.

**Methods:** Gastroenterologists and IBS patients completed online surveys including Theory of Planned Behaviour (TPB) constructs. Among IBS patients, multiple linear regression determined the multivariate associations between TPB variables and intention to practice yoga while controlling for significant socio-demographic variables. Gastroenterologists were asked about their attitudes and current yoga recommendations for patients with IBS. Chi-square analyses examined associations between gastroenterologists' demographics and recommending yoga. Binomial logistic regression described associations between attitude variables and current yoga recommendations.

**Results:** For patients ( $n = 109$ ), controllability ( $\beta = 0.5$ ,  $P < 0.001$ ), affective attitude ( $\beta = 0.4$ ,  $P < 0.05$ ) and self-efficacy ( $\beta = 0.3$ ,  $P < 0.05$ ) were significantly associated with intention to do yoga in the regression model. TPB variables explained 34% of the variance in patients' intentions to practice yoga. The binomial regression analysis revealed that gastroenterologists ( $n = 79$ ) who have confidence in recommending yoga (39%) were seven times more likely to recommend it (odds ratio = 7.3,  $P = 0.002$ ) and those who agreed yoga improves IBS symptom severity (54%) were 10 times more likely to recommend yoga (odds ratio = 10.1,  $P < 0.001$ ). Most (86%) wanted more evidence to support efficacy of yoga for IBS and 44% asked for more knowledge on how to refer a patient.

**Conclusion:** Controllability, affective attitude and self-efficacy predicted IBS patients' intentions to practice yoga. Although gastroenterologists believed yoga is safe and beneficial for IBS patients, most do not recommend yoga due to lack of confidence and scientific evidence.

**Keywords:** Complementary and alternative medicine; Gastroenterologists; Irritable bowel syndrome; Theory of planned behaviour; Yoga

## INTRODUCTION

Irritable bowel syndrome (IBS) is a prevalent (10% to 20%) gastrointestinal disorder involving alterations of the gut-brain axis. IBS symptoms include abdominal pain and disordered defecation associated with some relief of symptoms following passage of bowel motions (1). IBS symptoms impair quality of life and lead to a significant cost burden to health care systems (2). The clinical management of IBS remains challenging and many patients feel dissatisfied with their medical care (3,4), leading to 50% of patients who seek complementary and alternative medicine (CAM), medical products and practices that are not part of standard medical care (5). Emerging research demonstrates yoga as a CAM is safe and effective in treating IBS (6). Yoga is the preferred CAM among 77% of IBS patients (7) surpassing

hypnotherapy, acupuncture, homeopathy and the use of suppositories (7).

Yoga is a mind-body-breath discipline. Research suggests yoga may be as effective as pharmacotherapy, cognitive-behavioural therapy, exercise and the low FODMAP diet to reduce IBS symptoms and improve stress, anxiety and depression in IBS patients (6,8,9). Improvements were seen in both physical health (IBS symptom severity, gastric motility, autonomic and somatic symptom scores and physical functioning) and mental health outcomes (depression, anxiety, gastrointestinal-specific anxiety and quality of life) (10). However, the relatively low-quality evidence resulting from heterogeneity of study designs, interventions, and outcome measures limit our ability to make specific recommendations about the use of yoga as therapy for patients with IBS (10).

Yoga targets the altered brain-gut axis found in IBS. Yoga may reduce inappropriate activation of the autonomic nervous system and regulate the hypothalamus-pituitary-adrenal axis and inflammatory processes by triggering a relaxation response (11). Despite evidence to support its use, gastroenterologists (GIs) infrequently discuss CAM therapies as part of IBS management (12). However, 70% of IBS, inflammatory bowel disease, and hepatology patients discuss CAM with their GI, with 42% of GIs encouraging the use of CAM (12). The reasons for failing to discuss CAM therapies supported by evidence are unknown. We speculate the reasons may be the lack of evidence to support CAM use in IBS and lack of time.

The Theory of Planned Behaviour (TPB) is a widely used social-cognitive theory to understand health behaviours in various disease and non-disease populations, including cancer (13), older adults (14), healthy adults (15), cardiac rehabilitation (16), dementia (17), diabetes (18) and rheumatoid arthritis (19) (Figure 1). The TPB proposes intention to engage in a behaviour is influenced by three constructs (20): An individual's *attitude* (the degree to which a person evaluates a behaviour as favourable), *subjective norm* (the perceived social pressures individuals feel from important others) and *perceived behavioural control* (an individual's perception of the ease or difficulty of performing a behaviour) (21).

The objectives of this study were to (a) use the TPB model to identify IBS patients' attitudes, subjective norms, perceived behavioural control and intention to practice yoga, and (b) identify GIs' attitudes, barriers, facilitators and current yoga recommendations as part of routine medical care for IBS patients.

## METHODS

### Participants and Procedures

Adults diagnosed with IBS by a healthcare professional (e.g., physician, nurse, dietitian) based on Rome IV criteria were recruited through (a) gastroenterology clinics in Calgary, Alberta, (b) social media, (c) self-referrals and (d) IBS patients enrolled in the IMAGINE cohort study at the University of Calgary. GIs across Canada who provided care to adult patients with IBS through the Canadian Association of Gastroenterology membership were identified. GIs and patients received an email invitation asking them to complete a cross-sectional online survey using the Research Electronic Data Capture (REDCAP) system (22,23). Two

email reminders were sent 2 weeks apart to increase participation rates. The University of Calgary Conjoint Health Research Ethics Board approved this study (ID: REB19-1456, ID: REB19-1113).

### Patient Survey

The patient survey assessed socio-demographic, clinical and TPB variables. *Socio-demographic information* was captured by self-report and included age, gender, ethnicity, marital status, education and annual family income. Clinical information included self-reported comorbidities, years since IBS diagnosis, current IBS medications (e.g., over-the-counter medications and supplements) and the use of CAMs to manage IBS symptoms. Yoga questions included yoga delivery preferences, past yoga experience and complementary and alternative medicine (CAM) use.

TPB survey questions were developed based on the previous literature and TPB standardized and validated questions to elicit responses (24) and pilot-tested with a small sample of reviewers. Yoga was defined as doing a practice consisting of postures, meditation, and breath work. We defined intention based on standardized TPB statements as *doing yoga (behaviour) every day (how often) for 10-20 minutes (how long) for the next eight weeks (length of time)*. This recommendation is based on study indicating the benefits of yoga for anxiety and depression following a program 5 days a week 30 minutes per day (25), which are similar to physical activity recommendations of 150 minutes per week.

*Attitude* was measured by two items (instrumental and affective attitude) on a 7-point Likert scale. Instrumental attitudes were measured with one item; "Doing yoga every day for 10-20 minutes for the next eight weeks would be" from 1 (very bad) to 7 (very good). Affective attitudes were measured by one item; "Doing yoga every day for 10-20 minutes for the next eight weeks would be" from 1 (unpleasant) to 7 (pleasant).

*Subjective norm* (injunctive and descriptive norms) was measured by two items on a 7-point scale. Injunctive norms were measured with one item; "Most people who are important to me would support me to do yoga daily for 10-20 minutes for the next eight weeks," from 1 (strongly disagree) to 7 (strongly agree). Descriptive norms were measured with one item; "Most people like me will do yoga daily for 10-20 minutes for the next eight weeks," from 1 (very unlikely) to 7 (very likely).

*Perceived behavioural control* (self-efficacy and controllability) was measured by two items on a 7-point scale. Self-efficacy was measured with one item; "I am confident that I can commit to doing yoga every day for 10-20 minutes for the next eight weeks," from 1 (not at all confident) to 7 (very confident). Controllability was measured with one item; "Doing yoga daily for 10-20 minutes for the next eight weeks is up to me," from 1 (strongly disagree) to 7 (strongly agree).

For *behavioural beliefs* patients listed what they believed to be the top three advantages and disadvantages of participating in daily yoga. For *normative beliefs*, patients listed the top three individuals or groups they believe would approve or disapprove of them participating in daily yoga. For *control beliefs*, patients listed what they thought were the top three main factors or circumstances that make it easier (facilitators) or more difficult (barriers) to engage in daily yoga. *Intention* to practice yoga was assessed using one item measured on a

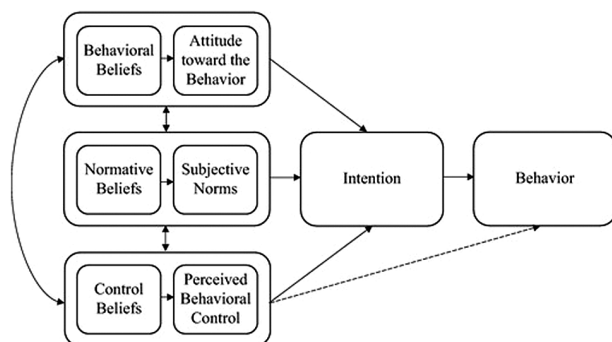


Figure 1. The theory of planned behaviour.

**Table 1.** Patient characteristics (N = 109)

|                                                               | n (%)       |
|---------------------------------------------------------------|-------------|
| Age (mean [SD])                                               | 43.0 (14.6) |
| Gender                                                        |             |
| Female                                                        | 100 (91.7)  |
| Male                                                          | 8 (7.3)     |
| Transgender                                                   | 1 (0.9)     |
| Ethnicity                                                     |             |
| Caucasian                                                     | 96 (88.1)   |
| Other                                                         | 13 (11.9)   |
| Marital Status                                                |             |
| Common law                                                    | 14 (12.8)   |
| Married                                                       | 60 (55.0)   |
| Never married                                                 | 25 (22.9)   |
| Separated or divorced                                         | 8 (7.3)     |
| Education                                                     |             |
| High school, trade, or apprenticeship                         | 10 (9.2)    |
| University or college                                         | 79 (72.5)   |
| Graduate or professional school                               | 20 (18.3)   |
| Income                                                        |             |
| ≤\$99,999                                                     | 49 (45.0)   |
| >\$100,000                                                    | 42 (38.5)   |
| Prefer not to disclose                                        | 18 (16.5)   |
| Currently on IBS medications                                  | 24 (22.0)   |
| Currently taking over-the-counter supplements for IBS         | 56 (51.4)   |
| Currently under the care of a gastroenterologist              | 23 (21.1)   |
| Comorbidities*                                                |             |
| Anxiety                                                       | 57 (52.3)   |
| Depression                                                    | 50 (45.9)   |
| Chronic fatigue syndrome                                      | 3 (2.8)     |
| Fibromyalgia                                                  | 9 (8.3)     |
| Chronic nausea                                                | 6 (5.5)     |
| Acid reflux disease                                           | 27 (24.8)   |
| IBD                                                           | 14 (12.8)   |
| Do you personally use/practice any CAM?*                      | 59 (54.1)   |
| Yoga                                                          | 36 (33.0)   |
| Mindfulness                                                   | 31 (28.4)   |
| Meditation                                                    | 31 (28.4)   |
| Cognitive behavioural therapy                                 | 12 (11.0)   |
| Hypnotherapy                                                  | 2 (1.8)     |
| Acupuncture                                                   | 16 (14.7)   |
| Massage                                                       | 31 (28.4)   |
| Teas                                                          | 27 (24.8)   |
| Oils                                                          | 21 (19.3)   |
| Herbal medicines                                              | 22 (20.2)   |
| Has your physician recommended you try any of the following?* |             |
| Yoga                                                          | 9 (8.3)     |
| Mindfulness                                                   | 9 (8.3)     |
| Meditation                                                    | 17 (15.6)   |
| Breath watching                                               | 5 (4.6)     |
| Unsure                                                        | 31 (28.4)   |
| Has another health professional recommended you try yoga?     |             |
| Yes                                                           | 25 (22.9)   |
| No                                                            | 70 (64.2)   |

**Table 1.** Continued

|                                             | n (%)     |
|---------------------------------------------|-----------|
| Unsure                                      | 12 (11.0) |
| Have you ever practiced or tried yoga?      |           |
| Yes                                         | 99 (90.8) |
| Do you currently practice yoga?             |           |
| Yes                                         | 38 (34.9) |
| Do you plan on continuing to practice yoga? |           |
| Yes                                         | 36 (97.4) |
| Would you be interested in trying yoga?     |           |
| Yes                                         | 63 (57.8) |
| No                                          | 2 (1.8)   |
| Unsure                                      | 6 (5.5)   |
| Which of the following would you prefer?*   |           |
| Attending an in-person yoga class           | 56 (51.4) |
| Doing yoga at home self-instructed          | 35 (32.1) |
| Doing yoga at home using online resources   | 83 (76.1) |
| No preference                               | 8 (7.3)   |

Other ethnicities include Chinese, Indigenous, Latin American, Middle Eastern, and South Asian.

The responses may not add up to 100% due to missing values.

CAM, Complementary and alternative medicine; IBD, Inflammatory bowel disease; SD, Standard deviation.

\*Respondents could select more than one option.

7-point scale from 1 (very unlikely) to 7 (very likely): “I intend to do yoga daily for 10-20 minutes for the next eight weeks.”

### Gastroenterologist Survey

This survey assessed attitudes, perceived supports, barriers, facilitators, and if they currently recommend yoga to patients with IBS. We defined yoga as “a practice that includes at least one of the following components: postures, breathing techniques, or meditation”. Demographic information included age, gender, province of residence, and the number of years in practice. We asked GIs to report their yoga practice and personal use of CAM. The survey questions were developed based on previous literature and pilot-tested with a small sample of reviewers.

*Attitudes* were assessed by asking GIs to respond to a list of statements on their beliefs about yoga, how likely they were to make a recommendation for yoga, and their delivery modality preferences on a 7-point Likert scale from strongly disagree/very unlikely (1) to strongly agree/very likely (7). *Perceived support* was assessed by asking GIs to list anyone who supports or does not support them in recommending yoga. *Barriers and facilitators* to recommending yoga were assessed by asking respondents to select one or more circumstances from a list that would make it more difficult (barriers) or easier (facilitators) to recommend yoga to their IBS patients. *Behaviour* was assessed by asking if they currently recommend yoga (yes or no).

### Data Analysis

The descriptive analyses summarized socio-demographic and clinical information, and survey responses. For the patient survey, one-way analysis of variance (ANOVA) explored associations between intention and categorical demographic

and clinical variables (age  $\leq 43$  versus  $>43$ ), gender, marital status, annual family income, ethnicity and the number of comorbidities ( $\leq 2$  versus 3 or more). Multiple linear regression analysis determined the multivariate associations between TPB variables (attitudes, subjective norms and perceived behavioural control) and intention to do yoga while controlling for socio-demographic and clinical variables found to be significantly correlated with intention.

For the gastroenterologist survey, attitude responses were averaged and then grouped into agreement (strongly agree/agree), neutral and disagreement (disagree/strongly disagree). Chi-square analyses examined associations between GI demographics/personal practice of yoga and current yoga recommendation (yes or no). Binomial logistic regression described associations between attitude variables (independent variables: yoga improves IBS symptoms, I feel confident in recommending yoga, there is sufficient scientific evidence on yoga for IBS) and whether the gastroenterologist currently recommends yoga (dependent variable: yes or no). The exponential beta coefficient was interpreted as the odds ratio. We used SPSS 26 for all analyses and an  $\alpha = 0.05$  was set as the threshold for determining statistical significance.

## RESULTS

### Patient Survey

A total of 109 individuals with IBS responded to the survey (Table 1). The mean age of the sample was 43 years (SD = 14.6), 92% female, and 88% Caucasian. Half of the respondents were married (55%). Most participants (91%) practiced yoga in the past for an average of 6.1 (SD = 5.5) years on average. More than half (54%) utilized CAM, and a third (33%) currently practice yoga. Few patients recall a yoga recommendation by their physician (8%). Patients were most interested in doing yoga at home using online resources (76%) or attending an in-person yoga class (51%).

### Patient's Intention to Practice Yoga

All TPB variables were associated with intention (Table 2). The strongest correlation was observed between intention and affective attitude ( $r = 0.72$ ,  $P < 0.001$ ). Multiple linear regression analyses examining the correlations of intentions to engage in daily yoga revealed that TPB variables explained 33.7% of the variance in intention ( $R^2 = 0.337$ ,  $P < 0.001$ ).

The strongest independent correlate of intention was controllability ( $\beta = 0.5$ , 95% CI: 0.2 to 0.9,  $P < 0.001$ ), followed by affective attitude ( $\beta = 0.4$ , 95% CI: 0.01 to 0.7,  $P = 0.043$ ) and self-efficacy ( $\beta = 0.3$ , 95% CI: 0.00 to 0.5,  $P = 0.04$ ).

### Patients' Behavioural, Normative, and Control Beliefs

The most common advantages of practicing yoga were relaxation, flexibility and strength (Table 3). The most common disadvantages were lacking time, self-discipline and cost. For *normative beliefs*, the most common individuals or groups who would approve of IBS patients engaging in daily yoga were partners, family and friends. Some patients (17%) listed at least one individual or group who would disapprove of them doing daily yoga, and these were employer/coworkers, family and religious groups. For *control beliefs*, patients perceived that they would engage in daily yoga if they were in a scheduled weekly group class led by an instructor, delivered online by a video or an application, was low-cost, and they had accountability. The most common *barriers* concerning daily yoga were the lack of time and inability to schedule it into daily life, lack of transportation and lack of space and skills to do yoga.

### Gastroenterologist Survey

Seventy-nine out of 450 invited GIs completed the survey (18% response rate), and Table 4 contains a summary of their characteristics. Two-thirds of the respondents were male (66%) and practiced in Alberta (62%). Three-quarters (72%) of respondents were early or mid-career physicians with 15 years or less of experience, and the majority were providing adult IBS care (87%). Half of the physician respondents (48%) practiced yoga and a third practiced meditation (30%) and mindfulness (33%).

### Gastroenterologists' Attitudes and Beliefs

GIs' attitudes and beliefs toward yoga as an effective treatment for patients with IBS are presented in Table 5. Most respondents agreed yoga is safe (94%), reduces stress (87%), improves anxiety (82%) and health-related quality of life (85%), and does not interfere with conventional IBS treatments (92%). Half (54%) believed yoga has the therapeutic ability to improve IBS symptoms. When asked to indicate how likely they are to recommend yoga as a treatment to their IBS patients, 54% of

**Table 2.** Multiple regression analysis to predict intention among patients from the TPB variables ( $n = 107$ )

| Predictors            | Unstandardized $\beta$<br>(95% CI) | $R^2$ | F-ratio | df | P         |
|-----------------------|------------------------------------|-------|---------|----|-----------|
| Instrumental attitude | 0.06 (−0.35, 0.47)                 |       |         |    | 0.772     |
| Affective attitude    | 0.35 (0.01, 0.68)                  |       |         |    | 0.043*    |
| Injunctive norm       | −0.11 (−0.39, 0.17)                |       |         |    | 0.431     |
| Descriptive norm      | 0.19 (−0.02, 0.39)                 |       |         |    | 0.081     |
| Self-efficacy         | 0.25 (0.00, 0.50)                  |       |         |    | 0.044*    |
| Controllability       | 0.51 (0.17, 0.86)                  |       |         |    | 0.004**   |
| Total model           |                                    | 0.337 | 8.572   | 6  | <0.001*** |

$\beta$ , unstandardized regression coefficient; CI, confidence interval; df, degrees of freedom.

\* $P < 0.05$ ;

\*\* $P < 0.01$ ,

\*\*\* $P < 0.001$ . Two patient records were missing data and were not included in this analysis.



**Table 3.** Most common self-reported behavioural, normative, and control beliefs of IBS patients regarding daily yoga practice (*N* = 109)

|                                                                | <i>N</i> |
|----------------------------------------------------------------|----------|
| <b>Behavioural beliefs</b>                                     |          |
| <i>Perceived advantages</i> (*Response percentage 100%)        |          |
| Relaxation                                                     | 62       |
| Flexibility                                                    | 51       |
| Strength                                                       | 22       |
| Stress relief                                                  | 19       |
| Calming                                                        | 17       |
| Mindfulness                                                    | 11       |
| Pain management                                                | 10       |
| IBS symptom management                                         | 8        |
| <i>Perceived disadvantages</i> (*Response percentage 86%)      |          |
| Time                                                           | 61       |
| Lacking self-discipline                                        | 9        |
| Cost                                                           | 9        |
| Don't know how                                                 | 9        |
| Lacking space                                                  | 7        |
| Previous health condition                                      | 7        |
| Concerned how it will affect IBS                               | 6        |
| Fatigue                                                        | 5        |
| <b>Normative beliefs</b>                                       |          |
| <i>People that would approve</i> (*Response percentage 86%)    |          |
| Partner                                                        | 66       |
| Family                                                         | 33       |
| Friends                                                        | 26       |
| Doctor                                                         | 23       |
| <i>People that would disapprove</i> (*Response percentage 32%) |          |
| Employer or co-workers                                         | 6        |
| Me                                                             | 3        |
| Family                                                         | 3        |
| Religious group                                                | 3        |
| <b>Control beliefs</b>                                         |          |
| <i>Facilitators</i> (*Response percentage 82%)                 |          |
| Group class                                                    | 21       |
| Low cost                                                       | 21       |
| Instructor                                                     | 21       |
| Online classes                                                 | 16       |
| Accountability                                                 | 15       |
| Having the time                                                | 14       |
| Scheduled                                                      | 13       |
| Weekly class                                                   | 13       |
| Videos or app                                                  | 11       |
| <i>Barriers</i> (*Response percentage 89%)                     |          |
| Lack of time/scheduling                                        | 40       |
| Cost                                                           | 17       |
| Feeling unwell                                                 | 10       |
| Transportation                                                 | 12       |
| Lacking space                                                  | 8        |
| Work commitments                                               | 8        |
| Location                                                       | 8        |
| Lack of skill                                                  | 8        |
| IBS symptoms                                                   | 7        |

IBS, Inflammatory bowel syndrome.  
 Respondents were asked to list (text free field) up to three answers for advantages, disadvantages, beliefs, supportive and unsupportive individuals, barriers, and facilitators.

\*Response percentage indicates the number of respondents who provided at least one response for each question.

GIs agreed with this statement. Only 15% believed scientific evidence to support the use of yoga as an effective treatment for IBS is sufficient, with 38% indicating a neutral response. Thirty-nine per cent agreed or strongly agreed they were confident in recommending yoga and 39% currently recommend yoga to their IBS patients. Most GIs stated they would recommend yoga to their IBS patients (84%). For those who were unwilling to recommend, 5 out of 13 cited lack of evidence (38%) as the top reason. GIs who practice yoga were more likely to recommend it compared to those who do not (92.1% versus 47.0%,  $P = 0.048$ ). When recommending yoga, 53% of GIs indicated they were likely to recommend a face-to-face yoga class and 43% would recommend a yoga class delivered virtually (Table 5). Eighty-five per cent were willing to refer their patients to a study testing such a program.

### Gastroenterologists' Recommendations of Yoga

The binomial logistic regression explained 51% of the variance in yoga recommendations ( $R^2 = 0.507$ ). Agreeing that yoga improves IBS symptoms added significantly to the model (odds ratio = 10.1, 95% CI: 2.5 to 40.8,  $P < 0.001$ ) as did confidence in recommending yoga (odds ratio = 7.3, 95% CI: 2.1 to 25.4,  $P = 0.002$ ), but agreeing there is sufficient scientific evidence for yoga in IBS was not significant (odds ratio = 2.5, 95% CI: 0.7 to 9.4,  $P = 0.166$ ).

### Gastroenterologists' Barriers and Facilitators

The main barriers to recommending yoga were lack of knowledge about how or where to refer a patient ( $n = 35$ , 44%), not enough knowledge to be able to discuss yoga with their patient ( $n = 32$ , 41%) and concern regarding the cost of doing yoga for the patient ( $n = 32$ , 41%; Table 6). GIs were not concerned about the safety of yoga for IBS ( $n = 4$ , 5%). Most respondents ( $n = 68$ , 86%) wanted to see more evidence to support the efficacy of yoga for IBS and informational resources on yoga that can be given to patients during their clinic visits ( $n = 54$ , 68%).

## DISCUSSION

Our study is the first to use a theoretical framework to examine the attitudes of GIs and patients toward yoga as a therapy to manage IBS. The patient survey found TPB variables explained 34% of the variance in intention to practice yoga among IBS patients. We also found a GIs had positive attitudes and beliefs toward yoga, but it was not reflected in their prescription pattern, highlighting a discrepancy between their attitudes and behaviours.

In breast, prostate and colorectal cancer populations, a similar TPB variable model (attitudes, perceived behavioural control, subjective norm and planning) explained 11%, 24%, and 24% of the variance in physical activity, respectively (26). In a sample of 120 type II diabetes patients, TPB variables (attitudes, perceived behavioural control, subjective norm and planning) explained 45% of the variance in intention to engage in physical activity (27). Attitudes and perceived behavioural control were significantly associated with intention to engage in physical activity, whereas subjective norm was not associated with intention.

In our study, the intention to engage in yoga was driven primarily by perceived behavioural control and attitude.

**Table 4.** Gastroenterologist characteristics and recommendation patterns of complementary and alternative medicine (*N* = 79)

|                             | <i>n</i> (%) |
|-----------------------------|--------------|
| Age (years)                 |              |
| 30–39                       | 18 (22.8)    |
| 40–49                       | 28 (35.4)    |
| 50–59                       | 22 (27.8)    |
| 60–69                       | 9 (11.4)     |
| 70+                         | 2 (2.5)      |
| Gender                      |              |
| Female                      | 27 (34.2)    |
| Male                        | 52 (65.8)    |
| Years of experience         |              |
| 0–4                         | 12 (15.2)    |
| 5–9                         | 14 (17.7)    |
| 10–14                       | 18 (22.8)    |
| 15–19                       | 4 (5.1)      |
| 20–25                       | 1 (1.3)      |
| 26 year or more             | 12 (15.2)    |
| Clinical practice*          |              |
| Children (0–11 years)       | 6 (7.6)      |
| Adolescents (12–17 years)   | 13 (16.5)    |
| Adults (18+ years)          | 69 (87.3)    |
| Province or territory       |              |
| Alberta                     | 49 (62.0)    |
| British Columbia            | 4 (5.1)      |
| Manitoba                    | 4 (5.1)      |
| New Brunswick               | 2 (2.5)      |
| Nova Scotia                 | 4 (5.1)      |
| Ontario                     | 14 (17.7)    |
| Quebec                      | 2 (2.5)      |
| Currently recommended CAMs* |              |
| Yoga                        | 31 (39.2)    |
| Meditation                  | 33 (41.8)    |
| Mindfulness                 | 39 (49.4)    |
| CBT                         | 43 (54.4)    |
| Hypnotherapy                | 9 (11.4)     |
| Acupuncture                 | 11 (13.9)    |
| Massage                     | 11 (13.9)    |
| Teas                        | 7 (8.9)      |
| Oils                        | 7 (8.9)      |
| Herbal medicines            | 16 (20.3)    |
| Other†                      | 4 (5.1)      |
| Personally practice*        |              |
| Yoga                        | 38 (48.1)    |
| Meditation                  | 24 (30.4)    |
| Mindfulness                 | 26 (32.9)    |
| CBT                         | 5 (6.3)      |
| Hypnotherapy                | 0 (0.0)      |
| Acupuncture                 | 6 (7.6)      |
| Massage                     | 26 (32.9)    |
| Teas                        | 5 (6.3)      |
| Oils                        | 2 (2.5)      |
| Herbal medicines            | 1 (1.3)      |
| Other†                      | 5 (6.3)      |

**Table 4.** Continued

|                                                     | <i>n</i> (%) |
|-----------------------------------------------------|--------------|
| Willing to recommend yoga                           |              |
| Yes                                                 | 66 (83.5)    |
| No                                                  | 13 (16.5)    |
| Reasons for not recommending yoga ( <i>n</i> = 13)* |              |
| Lack of evidence                                    | 5 (38.5)     |
| Not beneficial                                      | 3 (23.1)     |
| Reason not provided                                 | 5 (38.5)     |
| Yoga setting recommendation                         |              |
| Home-based                                          | 12 (15.2)    |
| Attend a class                                      | 35 (44.3)    |
| Online or web-based                                 | 6 (7.6)      |

CAMs, Complementary and alternative medicines; CBT, Cognitive behavioural therapy.

The responses may not add up to 100% due to missing values.

\*Respondents could select more than one option;

†Other includes cardiovascular exercise, CBD;

‡Other includes exercise, acupressure, Pilates, chiropractic, prayer. Values may not add up to 100% due to missing data.

IBS patients' perceived controllability and self-efficacy were among the strongest predictors of their intentions to practice yoga. These findings are consistent with the notion that perceived behavioural control predicts behaviour directly (28), particularly self-efficacy (29). Self-efficacy is also the strongest predictor of intention to engage in physical activity among cancer survivors (30). The finding that affective attitude was also a significant predictor of intention is similar to other chronic diseases, including cancer, type II diabetes and individuals with physical disabilities.

We found GIs had positive attitudes and beliefs toward yoga. Yet, it was not reflective in their prescription pattern, highlighting a discrepancy between their attitudes and behaviours. GIs who had experience practicing yoga were more likely to recommend yoga compared to GIs who did not. Previous literature has not explored these relationships among GIs in the context of IBS. There are similar findings regarding this discrepancy between beliefs on CAMs, including yoga, and prescription patterns among GIs treating inflammatory bowel disease (31), infectious disease physicians (32) and general practitioners (33). Although GIs had positive attitudes toward yoga to manage stress and mental health in IBS, these beliefs did not translate to beliefs yoga can improve IBS symptoms through the brain-gut axis connection. This belief may be influenced by the perception yoga is a physical activity rather than a practice that includes breathing and meditation. We did not find any of the demographic characteristics examined (e.g., age, gender, years of experience, province) associated with recommending yoga among GIs.

A major barrier to recommending CAM is the lack of scientific evidence for its use (32,34), noting physicians primarily rely on scientific evidence and clinical research to guide their treatment plan (32). In our study, only 15% of GIs agreed the scientific evidence for yoga is sufficient. However, our regression model indicated lack of scientific evidence was not predictive of GIs' recommendation of yoga. Those who agreed yoga is beneficial for IBS were ten times more likely to

**Table 5.** GIs' attitudes, beliefs and intentions to recommend yoga for patients with IBS (*N* = 79)

|                                                                                                                                                                                        | Agree<br><i>n</i> (%)  | Neutral<br><i>n</i> (%) | Disagree<br><i>n</i> (%) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------|--------------------------|
| <b>Attitudes and beliefs</b>                                                                                                                                                           |                        |                         |                          |
| Yoga is safe for patients with IBS                                                                                                                                                     | 73 (93.7)              | 3 (3.8)                 | 2 (2.5)                  |
| Yoga reduces stress                                                                                                                                                                    | 69 (87.3)              | 7 (8.9)                 | 3 (3.8)                  |
| Yoga improved health-related quality of life                                                                                                                                           | 67 (84.8)              | 9 (11.4)                | 3 (3.8)                  |
| Yoga reduces the symptoms of anxiety*                                                                                                                                                  | 65 (82.3)              | 11 (13.9)               | 2 (2.5)                  |
| Yoga reduces the symptoms of depression                                                                                                                                                | 49 (62.0)              | 22 (27.8)               | 8 (10.1)                 |
| Yoga improves IBS symptom severity                                                                                                                                                     | 43 (54.4)              | 29 (36.7)               | 7 (8.9)                  |
| GIs should recommend yoga to their patients with IBS                                                                                                                                   | 38 (48.1)              | 32 (40.5)               | 9 (11.4)                 |
| The scientific evidence to support the use of yoga as an effective treatment for IBS is lacking                                                                                        | 35 (44.3)              | 30 (38.0)               | 12 (15.2)                |
| I am confident in recommending yoga as an effective treatment for IBS                                                                                                                  | 31 (39.2)              | 26 (32.9)               | 22 (27.8)                |
| Yoga improves compliance with conventional IBS treatments                                                                                                                              | 16 (20.3)              | 51 (64.6)               | 12 (15.2)                |
| My colleagues approve of yoga as a treatment for IBS patients                                                                                                                          | 15 (19.0)              | 48 (60.8)               | 15 (19.0)                |
| Yoga interferes with conventional IBS treatments*                                                                                                                                      | 2 (2.5)                | 3 (3.8)                 | 73 (92.4)                |
| <b>Web-based yoga program</b>                                                                                                                                                          |                        |                         |                          |
| I am willing to refer patients to a research study testing a web-based yoga program for IBS patients                                                                                   | 68 (86.1)              | 6 (7.6)                 | 5 (6.3)                  |
| A web-based yoga program has the potential to improve patients' engagement in their own care                                                                                           | 62 (78.5)              | 13 (16.5)               | 4 (5.1)                  |
| I believe my patients would be interested in a web-based yoga program                                                                                                                  | 60 (75.9)              | 14 (17.7)               | 5 (6.3)                  |
| I am willing to recommend a web-based yoga program to my patients with IBS                                                                                                             | 54 (68.4)              | 20 (25.3)               | 5 (6.3)                  |
| I am concerned about the safety of an online yoga program that is not supervised by a qualified instructor                                                                             | 8 (10.1)               | 16 (20.3)               | 54 (68.4)                |
|                                                                                                                                                                                        | Likely<br><i>n</i> (%) | Neutral<br><i>n</i> (%) | Unlikely<br><i>n</i> (%) |
| <b>Recommendation patterns</b>                                                                                                                                                         |                        |                         |                          |
| How likely are you to recommend yoga as a treatment to your IBS patients?                                                                                                              | 43 (54.4)              | 21 (26.6)               | 15 (19.0)                |
| How likely are you to recommend yoga to your IBS patients that is delivered face-to-face by a certified yoga instructor?                                                               | 42 (53.2)              | 21 (26.6)               | 16 (20.3)                |
| How likely are you to recommend yoga to your IBS patients that is delivered electronically (e.g., online videos, web-based) whose content is developed by a certified yoga instructor? | 34 (43.0)              | 21 (26.6)               | 24 (30.4)                |

IBS, Inflammatory bowel syndrome; SD, standard deviation.

Responses were collected on a 7-point Likert scale from strongly disagree/very unlikely (1) to strongly agree/very likely (7) and means calculated based on these responses. Agreement (strongly agree/agree), neutral and disagreement (disagree/strongly disagree) are grouped.

\*Values may not add up to 100 percent due to missing data.

recommend yoga to their IBS patients. There is accumulating evidence and no risk of harm to support the use of yoga as a therapy in managing IBS (6), however, yoga is not included in clinical practice guidelines for IBS (35). Interestingly, other low-quality evidence therapies such as peppermint oil and cognitive-behavioural therapy are recommended to some patients (35). Building awareness and providing education about yoga as therapy among GIs is needed to shift their attitudes and beliefs toward yoga to meet patients' needs and offer adequate information (31,33).

It is encouraging many GIs are willing to recommend yoga. Yet GIs cited lack of knowledge as the main barrier. Half considered themselves unqualified or lacked

sufficient knowledge of yoga to provide appropriate advice and recommendations around yoga. Further, our regression model revealed those who are confident in recommending yoga are seven more times likely to recommend it. Lack of knowledge among physicians has been a well-cited reason for the reluctance to recommend yoga and other CAM therapies to patients (34). One in five patients listed their doctor as a normative referent that would approve of doing yoga. This finding highlights a gastroenterologist's recommendation is one factor to consider in promoting yoga as a therapy for patients with IBS. This also presents an opportunity for GIs to increase their knowledge and understanding of CAM to support patients holistically. Patients may be inclined to integrate

**Table 6.** Barriers and facilitators for GIs to recommend yoga (*N* = 79)

|                                                                                          | <i>n</i> (%) |
|------------------------------------------------------------------------------------------|--------------|
| <b>Barriers</b>                                                                          |              |
| I do not have the <i>knowledge</i> on how or where to refer a patient                    | 35 (44.3)    |
| I do not have the <i>knowledge</i> on yoga to discuss it with the patient                | 32 (40.5)    |
| I feel that patients will be concerned about the <i>cost</i> of doing yoga               | 32 (40.5)    |
| I am not convinced of the literature on the <i>efficacy</i> with respect to yoga for IBS | 30 (38.0)    |
| There is limited <i>time</i> during a patient visit                                      | 28 (35.4)    |
| This is not part of my regular clinic <i>routine</i>                                     | 27 (34.2)    |
| My <i>training</i> does not qualify me to discuss it                                     | 15 (19.0)    |
| I am not convinced of the literature on the <i>safety</i> with respect to yoga for IBS   | 4 (5.1)      |
| <b>Facilitators</b>                                                                      |              |
| Having more <i>evidence</i> that supports the efficacy of yoga for IBS                   | 68 (86.1)    |
| Informational <i>resources</i> on yoga (e.g., pamphlets) that can be give to patients    | 54 (68.4)    |
| <i>Posters</i> in the clinic so that patients can ask about yoga                         | 31 (39.2)    |
| Have in-clinic <i>support</i> to speak to patients about yoga                            | 26 (32.9)    |
| Having more <i>evidence</i> that support the safety of yoga for IBS                      | 18 (22.8)    |

IBS, Irritable bowel syndrome.

holistic solutions when such recommendations come from a credible source such as their physician (36).

Our findings provide a foundation for future research exploring the acceptance of such therapies. This study has limitations that warrant mention. First, we lacked information about how GIs in our study were compensated (fee-for-service or flat fee). Method of compensation and time spent discussing IBS therapies may be correlated, but we did not find limited clinic time to be a major barrier. There may have been a selection bias where GIs that prescribed yoga, personally practiced yoga or had positive attitudes toward yoga were more likely to participate in the study. Future studies should aim to survey a more diverse sample of GIs. Further, our small sample size of gastroenterologists limited the number of dependent variables explored in the regression analysis. Our study results may not be generalizable, as two-thirds of the GIs practiced in Alberta and patients were primarily Caucasian, female, had a high household income and reported a history of previous yoga practice. Further, the patients identified through gastroenterology clinics may have more severe disease or have disease refractory to several therapeutic modalities that may lead to study referral, thus introducing selection bias. The TPB also has its limitations, namely that people's attitudes change over time and intentions do not necessarily correlate with behaviour all the time.

Since theory-informed design could play an important role in intervention efficacy, we propose additional research to build on these findings and further explore factors (e.g., emotions, personality traits or past behaviour (20)) that may influence IBS patients' intention to use yoga as a therapy. Future research using theoretical frameworks should also measure behaviour to determine if intentions translated into yoga behaviour. Any intervention should consider patient barriers (e.g., cost) and facilitators (e.g., accountability) to doing yoga in various environments (e.g., virtual delivery) and support systems (e.g., group class). Lastly, considering the interests of GIs in virtually delivered

yoga interventions, we propose future research consider developing and testing the feasibility and effectiveness of such programming.

Affective attitude, controllability and self-efficacy are key theoretical correlates of intention to practice yoga in patients with IBS. Researchers can use these findings to develop theoretically salient supportive lifestyle interventions for this population. In addition, GIs may consider increasing their knowledge of yoga supported by evidence to provide therapeutic options given that many IBS patients turn to these therapies. GI's attitudes toward such therapies play an important role in establishing a positive patient–physician relationship.

## FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors. D.M. receives partial salary support through the Arthur J.E. Child Chair.

## CONFLICT OF INTEREST

None declared.

## AUTHOR CONTRIBUTIONS

A.D. was involved in all aspects of study design, recruitment, data collection and analysis, and is the lead author of the manuscript. D.M., J.K.V., Y.N., and L.M.T. assisted with study design respective to their expertise. Y.N. provided their clinical expertise and patient recruitment through the clinic. M.R. is the senior author and has guided the work of this research to support AD with their training. All authors reviewed the manuscript for study design and provided critical insight into manuscript content and approved the final version for submission.



## REFERENCES

1. Drossman DA. Functional gastrointestinal disorders: History, pathophysiology, clinical features and Rome IV. *Gastroenterology* 2016; 150(6):1262–79. doi:10.1053/j.gastro.2016.02.032
2. Lacy BE, Pimentel M, Brenner DM, et al. ACG clinical guideline: Management of irritable bowel syndrome. *Am J Gastroenterol* 2021;116(1):17–44.
3. Sabate JM, Ducrotte P, Piche T, et al. Expectations of IBS patients concerning disease and healthcare providers: Results of a prospective survey among members of a French patients' association. *Clin Res Hepatol Gastroenterol* 2020;44(6):961–7.
4. Halpert A, Godena E. Irritable bowel syndrome patients' perspectives on their relationships with healthcare providers. *Scand J Gastroenterol* 2011;46(7-8):823–30.
5. Kong SC, Hurlstone DP, Pocock CY, et al. The incidence of self-prescribed oral complementary and alternative medicine use by patients with gastrointestinal disease. *J Clin Gastroenterol* 2005;39:138–41.
6. Schumann D, Anheyer D, Lauche R, et al. Effect of yoga in the therapy of irritable bowel syndrome: a systematic review. *Clin Gastroenterol Hepatol* 2016;14(12):1720–31.
7. Harris LR, Roberts L. Treatments for irritable bowel syndrome: Patients' attitudes and acceptability. *BMC Complement Altern Med* 2008;8:65.
8. Peterson CT, Bauer SM, Chopra D, et al. Effects of Shambhavi Mahamudra Kriya, a multicomponent breath-based yogic practice (pranayama), on perceived stress and general well-being. *J Evid Based Complement Altern Med* 2017;22(4):788–97.
9. Ross A, Thomas SA. The health benefits of yoga and exercise: A review of comparison studies. *J Altern Complement Med* 2010;16:3–12.
10. D'Silva A, MacQueen G, Nasser Y, Taylor LM, Vallance JK, Raman M. Yoga as a therapy for irritable bowel syndrome. *Dig Dis Sci* 2019; 65(9):2503–14. doi:10.1007/s10620-019-05989-6
11. Jeter PE, Slutsky J, Singh N, et al. Yoga as a therapeutic intervention: A bibliometric analysis of published research studies from 1967 to 2013. *J Altern Complement Med* 2015;21(10):586–92.
12. Hung A, Kang N, Bollom A, et al. Complementary and alternative medicine use is prevalent among patients with gastrointestinal diseases. *Dig Dis Sci* 2015;60:1883–8.
13. Finne E, Glausch M, Exner AK, et al. Behavior change techniques for increasing physical activity in cancer survivors: A systematic review and meta-analysis of randomized controlled trials. *Cancer Manag Res* 2018;10:5125–43.
14. Senkowski V, Gannon C, Branscum P. Behavior change techniques used in theory of planned behavior physical activity interventions among older adults: A systematic review. *J Aging Phys Act* 2019;27:746–54.
15. Darker CD, French DP, Eves FF, et al. An intervention to promote walking amongst the general population based on an 'extended' theory of planned behaviour: A waiting list randomised controlled trial. *Psychol Health* 2010;25(1):71–88.
16. Bermudez T, Bolger N, Bierbauer W, et al. Physical activity after cardiac rehabilitation: Explicit and implicit attitudinal components and ambivalence. *Health Psychol* 2021;40:491–501.
17. Nyman SR, Adamczewska N, Howlett N. Systematic review of behaviour change techniques to promote participation in physical activity among people with dementia. *Br J Health Psychol* 2018;23(1):148–70.
18. Plotnikoff RC, Courneya KS, Trinh L, et al. Aerobic physical activity and resistance training: An application of the theory of planned behavior among adults with type 2 diabetes in a random, national sample of Canadians. *Int J Behav Nutr Phys Act* 2008;5:61.
19. Larkin L, Kennedy N, Gallagher S. Promoting physical activity in rheumatoid arthritis: A narrative review of behaviour change theories. *Disabil Rehabil* 2015;37(25):2359–66.
20. Ajzen I. The theory of planned behaviour: Reactions and reflections. *Psychol Health* 2011;26(9):1113–27.
21. Glanz K, Rimer BK, Viswanath K. *Health Behavior: Theory, Research, and Practice*, 5th Edition. San Francisco, CA: Jossey-Bass; 2015:95–124.
22. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. *J Biomed Inform* 2019;95:103208.
23. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42(2):377–81.
24. Ajzen I. Constructing a theory of planned behavior questionnaire 2019. Available from: [https://people.umass.edu/ajzen/pdf/tpb\\_measurement.pdf](https://people.umass.edu/ajzen/pdf/tpb_measurement.pdf)
25. de Manincor M, Bensoussan A, Smith CA, et al. Individualized yoga for reducing depression and anxiety, and improving well-being: A randomized controlled trial. *Depress Anxiety* 2016;33(9):816–28.
26. Forbes CC, Blanchard CM, Mummery WK, et al. A comparison of physical activity correlates across breast, prostate and colorectal cancer survivors in Nova Scotia, Canada. *Support Care Cancer* 2014;22(4):891–903.
27. Ferreira G, Pereira MG. Physical activity: The importance of the extended theory of planned behavior, in type 2 diabetes patients. *J Health Psychol* 2017;22(10):1312–21.
28. Rhodes RE, Nigg CR. Advancing physical activity theory: A review and future directions. *Exerc Sport Sci Rev* 2011;39:113–119.
29. Sheeran P, Klein WM, Rothman AJ. Health behavior change: Moving from observation to intervention. *Annu Rev Psychol* 2017;68:573–600.
30. Hirschey R, Bryant AL, Macek C, et al. Predicting physical activity among cancer survivors: Meta-analytic path modeling of longitudinal studies. *Health Psychol* 2020;39(4):269–80.
31. Lindberg A, Ebbeskog B, Karlen P, Oxelmark L. Inflammatory bowel disease professionals' attitudes to and experiences of complementary and alternative medicine. *BMC Complement Altern Med* 2013;13:349–58.
32. Shere-Wolfe KD, Tilburt JC, D'Adamo C, et al. Infectious diseases physicians' attitudes and practices related to complementary and integrative medicine: Results of a national survey. *Evid Based Complement Alternat Med* 2013;2013:294381.
33. Sewitch MJ, Cepoiu M, Rigillo N, et al. A literature review of health care professional attitudes toward complementary and alternative medicine. *Complement Health Pract Rev* 2008;13:139–54.
34. Singhal S, Roy V. Awareness, practice and views about integrating AYUSH in allopathic curriculum of allopathic doctors and interns in a tertiary care teaching hospital in New Delhi, India. *J Integr Med* 2018;16(2):113–9.
35. Moayyedi P, Andrews N, MacQueen G, et al. Canadian Association of Gastroenterology clinical practice guideline for the management of irritable bowel syndrome (IBS). *J Can Assoc Gastroenterol* 2019;2:6–29.
36. Harvey JM, Sibelli A, Chalder T, et al. Desperately seeking a cure: Treatment seeking and appraisal in irritable bowel syndrome. *Br J Health Psychol* 2018;23(3):561–79.