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Comparing the effect of internet-delivered short-term progressive muscle relaxation and psychoeducation on mindful ability, visceral hypersensitivity and symptoms of patients with irritable bowel syndrome

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Abstract:

BACKGROUND: Irritable bowel syndrome (IBS) is a functional bowel disorder that psychological interventions are effective on it. The present study aimed to compare the effect of internet-delivered short-term PMR (iPMR) and psychoeducation on mindful ability (MA), visceral hypersensitivity (VH), and symptoms of patients with IBS.

MATERIALS AND METHODS: This randomized clinical trial was performed on individuals with IBS in 2020, recruiting a total of 60 patients fulfilling the inclusion criteria. Prior to the intervention, the Freiburg Questionnaire- Short Form (FMI-SF), the Visceral Sensitivity Questionnaire (VSI), and the Gastrointestinal Symptoms Rating Scale (GSRS) were filled out for the patients. Patients were divided into iPMR and psychoeducation groups randomly. All training in both groups was accomplished via WhatsApp social network. FMI-SF, VSI, and GSRS questionnaires for patients were completed 1 month (post-test) and 2 months later (follow-up). The data was analyzed by SPSS-23 software and one-way analysis of variance (ANOVA).

RESULTS: Compared to the psychoeducation group, the MA of the iPMR group increased significantly in post-test and follow-up (43.06 ± 7.12 and 42.88 ± 6.28 vs 51.23 ± 11.7 and 56.74 ± 12.36 and $P < 0.001$) and their VH decreased significantly (37.85 ± 11.6 and 38.03 ± 11.8 vs 26.9 ± 6.45 and 22.46 ± 5.32 and $P < 0.001$). Also, their GSRS had significant decreases (43.27 ± 10.73 and 41.18 ± 9.31 vs 32.33 ± 8.21 and 25.79 ± 6.30 and $P < 0.001$).

CONCLUSION: The findings showed iPMR in patients with IBS, in spite of a few sessions and internet-delivered approach, increased MA and decreased VH and gastrointestinal symptoms of them.

Keywords:

Irritable bowel syndrome, muscle relaxation, visceral

Introduction

Irritable bowel syndrome (IBS) is a type of bowel dysfunction characterized by chronic abdominal pain, discomfort, bloating, and changes in bowel habits in the absence of an underlying structural or organic cause, which also happens to be well-known as a psychosomatic disorder associated with the gastrointestinal tract affecting bowel motility and producing

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cramps.[1] The prevalence of this disease in society is high and estimated to be 1.7-20%.[2]

Several underlying mechanisms have been assumed in the pathophysiology of IBS as a multifactorial disease. They included Inflammatory reactions, a history of childhood infections, gastrointestinal dysmotility, changes in gut microflora, food intolerance, genetic factors, psychological factors, and hypersensitivity in visceral perception.[3]

Visceral hypersensitivity (VH) is defined as an enhanced perception of mechanical triggers applied to the bowel which seems as pain and discomfort.[4] VH is known as decreased thresholds of stimuli perception generated from the gastrointestinal tract. The prevalence of VH in patients with IBS was reported between 33% to 90%.[4]

A variety of psychological interventions have been introduced in addition to pharmacological treatments to help resolve IBS symptoms. Progressive muscle relaxation (PMR) is a simple yet oldest form of relaxation technique that has been proven to be effective. PMR is an intervention that embodies the principles of psychoneuroimmunology to achieve physiological equilibrium in different systems of the body.[5] Uncontrollability and social-evaluation threat (e.g., judgment or evaluation) are the two main stressors that activate the sympathetic nervous system (SNS).[6] Therefore, having the ability to being nonjudgmental and tolerance of ambiguity (contrasting needs to control)-named mindful ability- can improve symptoms of diseases with SNS involvement such as IBS.

Mindfulness is the awareness that arises from paying attention on purpose, in the present moment, non-judgmentally.[7] Mindfulness practices help to bring focus to a specific "object of awareness" happening in the present moment. These "objects" can include various internal or external sensory experiences such as the breath, body sensations, thoughts, or sounds. A key element of mindfulness practices is noticing experiences with openness and curiosity, without trying to change or suppress them.[6] Some studies showed PMR focusing on internal senses especially the breath and body sensations can increase mindful ability (MA).[6,8]

Numerous studies portrayed relaxation techniques as effective for many illnesses and problems such as generalized anxiety disorder,[9] sleep disorders,[10] headache,[11] hypertension[12], and cardiovascular diseases.[13] Although various studies have shown the effectiveness of PMR and similar techniques such as mindfulness-based treatments (MBT) in reducing IBS symptoms,[14,15] the literature lacks studies that examine the benefits of short-term training. Especially given the current pandemic of COVID-19, social media and virtual platforms have gained more fame in terms of communication and access than ever before. So, this study aimed to compare the effect of internet-delivered and short-term PMR coincidently and psychoeducation on mindful ability, visceral hypersensitivity, and symptoms of patients with IBS.

Materials and Methods

Study design and setting

In this randomized clinical trial with 3 stages of pre-test, post-test and follow-up, participants were selected from the patients with IBS that were referred to Hakim Poursina Digestive Research Center in Isfahan for treatment.

Study participants and sampling

The participants were selected by a simple randomized sampling method. The study sample size obtained 60 patients according to the formula below:

$$N = (Z_{1-\alpha/2} + Z_{1-\beta})^{2*} (\sigma_1^2 + \sigma_2^2)/d^2$$

Counting the possible dropout of the sample, 80 patients were enrolled in the study. Inclusion criteria were as follows: age between 18-50 years, IBS diagnosis based on Rome III criteria, diagnosis by a gastroenterologist or internal medicine specialist, no known major psychiatric illness, Absence of substance-related disorders, literacy, failure to receive psychological treatment during the last six months, and consent to participation. Exclusion criteria included: reluctance to participate in the study at any time, manifestations of new symptoms such as gastrointestinal bleeding, bloody stools, fever, etc., during the study, not attending iPMR sessions and not doing homework, and those diagnosed with a psychiatric illness and requiring medications.

Data collection tool and technique

The two groups filled out the study questionnaire including demographic characteristics and history of GI disease, the Freiburg Short Form Mindfulness Questionnaire (FMI-SF), Visceral Sensitivity Inventory (VSI), and Gastrointestinal Symptoms Rating Scale (GSRS) in the pre-test, 1 month and 2 months later.

The FMI-SF was designed to measure mindfulness as a multidimensional construct. It initially consisted of 30 questions, which were later replaced with a shorter form with 14 items, more suitable for the general population. The 13 questions based on a 4-point Likert scale (rarely = 1 to almost always = 4) were filled out by the patients. The minimum score for this questionnaire is 14 and the maximum is 56, while a higher score indicates greater levels of mindfulness.[16]

The VSI comprising 15 questions, presents to be a great tool for assessing gastrointestinal anxiety in patients with irritable bowel syndrome. The validity of this tool based on the focus group method has been reported as appropriate and reliability was calculated as 0.93 with alpha Cronbach.[17]

The GSRS questionnaire is another useful tool to evaluate GI disorders based on symptoms and clinical relevance. This questionnaire is composed of 13 questions, each given a score of no discomfort (0) to severe discomfort (7) based on a 7-point Likert scale and measures 5 important domains related to digestion. These include heartburn, reflux, diarrhea, constipation, and indigestion. The final score is the sum of the scores from each subscale. A high score denotes the exacerbation of symptoms. In Our study Cronbach's alpha obtained 0.84 after assessing the reliability of this tool on 40 patients, indicating its appropriateness.

The iPMR group received short-term psychoeducation, which included a brief description of the disorder, and nutritional and psychological factors affecting it and taught PMR (based on 12 big muscles groups of Öst *et al*.,[18]. For this purpose, the patients received the audio file of this technique with the voice of the therapist, and for 4 weeks, the patients were being followed through WhatsApp in terms of implementation of the technique and to address other possible problems that would arise with the internet-delivered sessions.

The psychoeducation group received the file that only contained a description of the disorder, psychological factors, and nutrition affecting it without the relaxation technique. At the end of the program, all the topics presented to the iPMR group were given to this group for ethical purposes. Two groups received their medical drugs based on physician prescriptions.

For data analysis, Chi-square was used to evaluating of the differences of patients in demographic variables, and an independent *t*-test was used to compare the mean scores of patients in the questionnaires (FMI-SF, VSI, and GSRS) in psychoeducation and iPMR groups. Mean scores of patients in the questionnaires in 3 phases of the study (pre-test, post-test, and follow-up) in each group were compared using repeated measures analysis of variance (RM-ANOVA). All analyzes were performed using SPSS software version 24 and a value of 0.05 was considered statistically significant.

Ethical consideration

The research was conducted in accordance with the tents of the Declaration of Helsinki. The Ethics Committee of Isfahan University of Medical Sciences (IUMS) approved this study (IR.MUI.MED.REC.1399.575). The trial protocol was approved in the Iranian registry of clinical trials IRCT20180909040974N4; https://en.irct.ir/trial/51756).

Results

Initially, 80 patients were enrolled in the study and were randomly divided into two groups of 40 patients (psychoeducation and iPMR). Finally, after the interventions and during the follow-up, 20 of the participants were eliminated and the data from 60 patients were analyzed as depicted in Figure 1.

The results related to the demographic characteristics of the patients studied were displayed in Table 1.

According to Table 1, no significant difference was observed in demographic variables of age, gender, occupation, and level of education between the psychoeducation and iPMR groups ($P > 0.05$).

Table 2 demonstrates the effect of short-term iPMR and psychoeducation on the mindfulness of patients in pre-test, post-test, and follow-up.

Table 1: Demographic characteristics of the subjects in psychoeducation and iPMR groups

Variable	Psychoeducation Number (percentage)	iPMR Number (percentage)	*P*
Age (Mean±SD)	32.61±4.52	33.56±4.83	0.91**
Gender			0.35*
Male	12 (40%)	14 (46.7%)	
Female	18 (60%)	16 (53.3%)	
Occupation			0.26*
Unoccupied	2 (6.6%)	0	
Worker	12 (40%)	12 (40%)	
Private sector	8 (26.7%)	8 (26.7%)	
Employee	8 (26.7%)	10 (33.3%)	
Education status			0.34
High school	4 (13.3%)	6 (20%)	
Diploma and advanced-diploma	6 (20%)	4 (13.3%)	
Undergraduate	12 (40%)	8 (26.7%)	
Masters	4 (13.3%)	6 (20%)	
Doctorate	4 (13.3%)	6 (20%)	

*Chi-square test. **Independent *t*-test. The results with a significance level of 0.05% were evaluated

Table 2: The effect of iPMR and psychoeducation on MA in the pre-test, post-test and follow-up

Variables		Psychoeducation (Mean±SD)	iPMR (Mean±SD)	*P***
Mindful ability	Pre-test	44.3±8.9	43.64±8.6	0.9
	Post-test	43.06±7.12	51.23±11.7	0.001
	follow-up	42.88±6.28	56.74±12.36	0.001
	*P**	0.7	0.001	-

*RM-ANOVA. **Independent *t*-test. The results with a significance level of 0.05% were evaluated

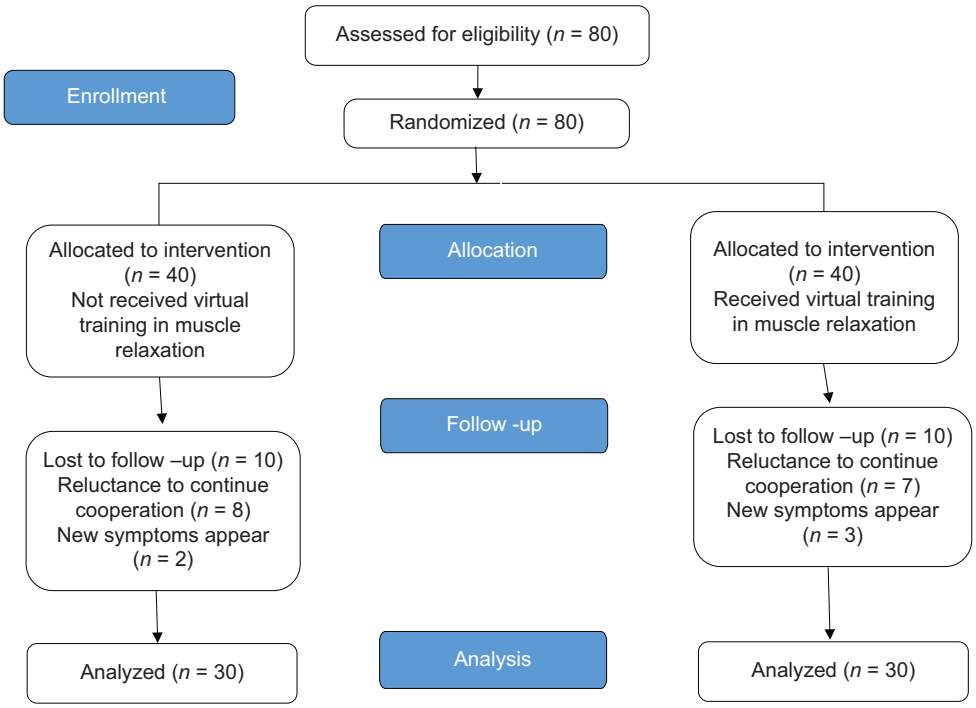

Figure 1: CONSORT diagram

According to Table 2, the mean scores of patients' mindful ability in the iPMR group were significantly higher than psychoeducation group ($P < 0.05$).

Table 3 denotes the effect of short-term iPMR and psychoeducation on visceral hypersensitivity in 3 phases of the study. According to the and Table 3, patients in the iPMR group significantly had lower scores in VH ($P < 0.05$).

Table 4 represents the effect of short-term iPMR and psychoeducation on gastrointestinal symptoms and their related domains including indigestion, abdominal pain, constipation, diarrhea, and the total score of the GSRS. According to Table 4, the rate of indigestion, abdominal pain, and diarrhea of patients in the iPMR group decreased significantly compared to the psychoeducation group ($P < 0.05$). Moreover, the overall mean score of the GSRS after iPMR decreased significantly ($P < 0.05$). However, no significant change in the rate of constipation in patients after iPMR was observed.

Table 3: The effect of iPMR and psychoeducation on VH in the pre-test, post-test and follow-up

Variables		Psychoeducation (Mean±SD)	iPMR (Mean±SD)	*P***
Visceral Sensitivity	Pre-test	36.3±10.7	38.12±11.09	0.56
	Post-test	37.85±11.6	26.9±6.45	0.001
	follow-up	38.03±11.8	22.46±5.32	0.001
	*P**	0.67	0.001	-

*RM-ANOVA. **Independent *t*-test. The results with a significance level of 0.05% were evaluated

Discussion

The current study compared the effect of short-term iPMR and psychoeducation on MA, VH, and symptoms of patients with IBS. The findings revealed that iPMR followed by psychoeducation significantly raised the level of MA in patients with IBS compared to those who received psychoeducation only. This finding is consistent with other research.[8,19] Although a few researches have shown similarities between PMR and MBT,[6,8] the issue remains controversial among researchers. This finding of our study shows the similarity of the two therapies because PMR has been able to increase the MA that is claimed to be specific to MBT. PMR through mechanisms related to MBT works in people with IBS. The two mechanisms are recognizing the dysfunctional triggers/irrational fear of the disease and changes in self-awareness.[19] On the other hand, in our study, FMI measures MA includes two fundamental facets: (a) focus on the present moment including bodily awareness, and (b) nonreactivity to the inner experience, thus an accepting attitude.[16] So, it can be said PMR through enhancing these facets has increased MA.

Furthermore, PMR similar to MBT improves quality of life by diminishing IBS symptoms. The sole purpose of the MBT is to achieve a state of alert, focused relaxation by deliberately paying attention to thoughts and emotions and understanding them as transient with a non-judgmental approach in an attempt to avoid rumination (repetitive negative thoughts), thereby preventing mental catastrophe, stress and other

Table 4: The effect of iPMR and psychoeducation on gastrointestinal symptoms in the pre-test, post-test and follow-up

GI symptoms		Psychoeducation (Mean±SD)	iPMR (Mean±SD)	*P***
Indigestion/ dyspepsia	Pre-test	7.95±1.6	7.85±1.2	0.12
	Post-test	7.83±0.9	5.54±0.62	0.001
	Follow-up	7.72±0.7	4.24±0.42	0.001
	*P**	0.23	0.001	-
Abdominal pain	Pre-test	17.5±3.6	18.03±4.72	0.37
	Post-test	16.64±2.37	9.14±1.57	0.001
	Follow-up	15.67±2.12	6.44±1.03	0.001
	*P**	0.33	0.001	-
Constipation	Pre-test	9.5±2.67	8.36±4.71	0.08
	Post-test	8.42±2.23	6.37±1.6	0.06
	Follow-up	8.10±2.18	6.19±1.1	0.06
	*P**	0.36	0.07	-
Diarrhea	Pre-test	13.5±2.36	12.75±2.45	0.67
	Post-test	11.30±1.51	6.91±0.88	0.001
	Follow-up	10.18±1.22	4.32±0.48	0.001
	*P**	0.06	0.001	-
Total score of GSRS	Pre-test	45.71±11.09	48.6±12.95	0.26
	Post-test	43.27±10.73	32.33±8.21	0.001
	Follow-up	41.18±9.31	25.79±6.30	0.001
	*P**	0.07	0.001	-

*RM-ANOVA. **Independent *t*-test. The results with a significance level of 0.05% were evaluated

dysfunctional coping mechanisms. Overall, this makes IBS more tolerable.[20]

Our study also noted that the VH in iPMR was reported significantly lower compared to the psychoeducation group. Although a systematic review on psychotherapy for IBS published by Cochrane Research Centre has claimed PMR evaluated only two outcomes, including IBS symptom relief and quality of life,[21] but our study showed the efficacy of PMR in the underling mechanisms of IBS such as VH and MA in patients with IBS. This finding is consistent with other studies especially examining the effect of psychological therapies similar to PMR on VH.[22,23] One of them[23] was a recent meta-analysis that evaluated 6 studies about the effect of mindfulness on IBS.

The neurological mechanism of VH in patients with IBS has been described in this way that they show altered responses in both the emotional arousal circuits (including the anterior cingulate cortex and the amygdala) and the cortex-modulating circuit (which includes the internal and external prefrontal cortex), which may be responsible for the arousal and cognitive aspects of VH.[24] PMR could help the acceptance of internal experiences[25,26] such as VH and improve them as well as bowel dysfunction through sending signals to the limbic system. This system inhibits the within-brain axes, including the hypothalamic-pituitary-adrenal axis which is responsible for the production of stress hormones[27,28] that has an important role in VH and overall the symptoms of IBS.

Another finding of the present study was that the rate of IBS symptoms including indigestion, abdominal pain, and diarrhea of patients diminished significantly in the iPMR group. Our results demonstrated that the overall mean score of the GSRS in the PMR group decreased significantly. This finding is consistent with other studies that showed the effect of PMR on IBS symptoms such as indigestion, diarrhea, constipation, and abdominal pain.[15,22]

It seems all dependent variables in the present study are related together. Because an effecting factor on VH and the symptoms of IBS is pain catastrophizing (PC). A study showed PC directly predicted VH and VH predicted IBS symptoms.[29] Having an accepting and non-judgmental view of the pain (or mindfulness of pain) could decrease exaggerated negative "mental set" toward pain and its consequences (that is named PC). It has been shown that PC has a negative relationship with MA and MBT could diminish PC.[30] Since PMR like MBT could increase MA, it could decrease VH and the symptoms of IBS. So, it can be concluded the underlying mechanism for the effect of PMR on IBS is MA.

Although a study declared that psychoeducation had healing effects in the long-term,[20] but in line with previous studies that stated short-term training had favorable effects,[24,31] our study also found that short-term PMR (4 sessions) did improve IBS symptoms.

The strength of the present study is using of short-term and internet-delivered PMR which leads to high accessibility and ease of application for a common clinical sample.

Limitation and recommendation

The limitation of this study were no comparison with a gold standard treatment such as Cognitive Behavior Therapy. Another limitation was the selection of participants from one treatment center. It is recommended that PMR compare with other treatments. Also, a study comparing this treatment in two short-term and long-term forms is recommended. In addition, other studies are recommended by selecting a sample group from multiple centers.

Conclusion

Our study showed it is reasonable and cost-effective to use short-term and internet-delivered PMR to improve symptoms of IBS in conjunction with medications. So, it should be considered as one of the interventions that should be considered by doctors, other health staff,

and treatment centers involved in the treatment of IBS patients.

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Conflicts of interest

There are no conflicts of interest.

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