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ORIGINAL ARTICLE

Exercise-based motivational interviewing for female patients with fibromyalgia: a case series

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Abstract The objective of the study is to determine the effects of motivational interviewing (MI), a novel technique of behavioral counseling to promote exercise, on pain and physical function in patients with fibromyalgia (FMS). Patients who met the American College of Rheumatology criteria for FMS and had a visual analog pain score of ≥6 were enrolled in a single group intervention pilot study. Participants received two supervised exercise sessions and an exercise prescription. Thereafter, six exercise-based MI phone calls were made over a 10-week period. Assessments were done at baseline, week 12 (immediate postintervention) and week 30 (follow-up). The primary endpoints were changes from baseline in the fibromyalgia impact questionnaire (FIQ)-pain and physical impairment at week 30. Secondary measures were brief pain inventory (BPI)-pain severity and BPI-pain interference, the number of exercise minutes (NEM) per week, and the arthritis impact measurement scale (AIMS)-depression. The 19 enrolled female participants had a mean age of 52.2±9.1 years, mean disease duration of 7.5±5.0 years, and a mean FIQ-pain score of 7.7±1.4. By week 30, there was significant improvement in both FIQ-pain (−2.6±2.6, $p<0.001$) and FIQ-physical impairment (−1.3±2.1, $p=0.01$). Likewise, BPI-pain severity and pain interference were reduced by −2.4±2.1 ($p<0.001$) and −2.4±2.0 ($p<0.001$), respectively. While the median NEM per week increased from 0 to 32 min ($p=0.001$) at week 30, AIMS-depression score was unchanged. In this pilot study, we conclude that telephone-delivered MI to promote exercise was associated with an improvement in patient's level of pain and physical impairment.

Keywords Adherence · Exercise · Fibromyalgia · Motivational interviewing · Pain and physical function

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Introduction

Fibromyalgia (FMS) is a poorly understood somatic syndrome, consisting mainly of chronic widespread pain (CWP) and tenderness. The impact of FMS and CWP is far reaching, affecting society as a whole in terms of economic consequences and lost work productivity and FMS patients individually, in terms of symptom burden, decreased physical functioning, and perhaps even increased mortality [1–7]. Currently, there are no medical therapies that have been approved by the US Food and Drug Administration for FMS. Nonetheless, a current evidence from two recent systematic reviews and one meta-analysis supports the efficacy of supervised aerobic exercise in reducing the symptoms of FMS [8–10]. Aerobic exercise has been shown to improve pain, aerobic capacity, function, and well-being [11–14].

Fundamental to the efficacy of exercise is the requirement that adherence be maintained. Unfortunately, adherence to an exercise regimen after a structured supervised

program is disappointingly low [11, 13–16]. Individuals who consistently exercise are most likely to experience benefits, both with respect to improvement in symptoms and daily function [11, 14, 15, 17, 18]. Incorporating a simple educational component to an exercise intervention does not appear to result in higher compliance with training sessions either [19, 20]. As adherence to exercise is difficult to achieve, behavioral intervention to promote exercise adherence is needed.

Miller et al. [21, 22] have developed an approach to clinician–client interactions that focuses on enhancing client's motivation to change. This approach, called motivational interviewing (MI), was initially developed to help problem drinkers cut down on, or abstain from, drinking alcohol. Within the principle of MI, motivation to change is viewed as something which is evoked in the patient, rather than imposed [23]. MI is a directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence [24].

The use of MI to encourage exercise is relatively new [25]. A recent meta-analysis showed medium effect sizes (0.53) of MI for increased physical activity in the general medical patient population [26, 27]. MI has also been effective in increasing exercise among diabetic patients and patients with chronic heart failure [28, 29]. Because exercise adherence is a critical factor to maintain improvements in FMS [11, 14, 19, 30, 31], we hypothesized that a telephone-delivered counseling, using MI technique to encourage home-based exercise, would improve exercise adherence and symptoms of FMS. In this quasi-experimental pilot study, we used a prepost design to determine the effect of exercise-based MI on patients' self-reported pain and physical function.

Materials and methods

Patients

Participants were recruited by referral from two rheumatology group practices (one university-based and one community-based). To be included, a patient had to fulfill the American College of Rheumatology criteria [32] for the diagnosis of FMS, with a visual analog pain score of ≥6 in the past 1 week, and be on stable doses of FMS medications for at least 4 weeks. Subjects were excluded if they (1) had been diagnosed with symptomatic cardiac or pulmonary disease; (2) had a severe degree of depression as defined by the patient health questionnaire nine-item depression scale (PHQ-9)>15 [33, 34]; or (3) had been doing at least moderately intense level of exercise (e.g., running, biking, jogging, brisk walking, etc.) for at least three times a week in the past 6 months.

Study procedure

After providing written informed consent, qualified participants entered a 30-week study protocol that included two phases: active intervention (weeks 1 to 12) and follow-up (weeks 12 to 30). All the subjects were given two education classes for 30 min each at weeks 1 and 2. The classes were taught in small groups of three to four subjects. The first class included information on FMS and the importance of exercise. During this visit, subjects were also given a handwritten individualized exercise prescription for the next 30 weeks and a heart rate monitor. The second class was devoted to barriers to exercise adherence. Both classes were taught by a rheumatology fellow (RK). At the end of each lecture, participants received a 15-min supervised exercise session with a fitness instructor (MR). The fitness instructor had no prior experience in working with FMS patients.

During the first visit, the participant, in consultation with the fitness instructor, decided on the duration and type of aerobic exercise activity (e.g., brisk walking, jogging, running, etc.). The initial exercise duration was between 5 to 10 min, at an intensity of 60% of the age predicted maximum heart rate (maxHR). Subjects were to increase the exercise duration by 1–2 min each week to a maximum of 30 min. At every 4-week period, the exercise intensity increased by 5% to attain a maximum of 70% of age predicted maxHR [35]. To help participants avoid over- or underdoing the prescribed exercise regimen, they were encouraged to wear the heart rate monitor every time they exercised. They were also advised to exercise on their own three times a week. Previous exercise trials in FMS utilized the same frequency of exercise per week [8, 13, 36–39].

No attempt was made to try to control drug therapy or routine physician visits during the study.

Telephone-delivered MI intervention

From weeks 3 to 12, subjects received six sessions of telephone-delivered counseling, each session averaging 25 min. The MI interviewer (JL) was a third year doctoral student in clinical psychology. Before the intervention, the interviewer was trained in MI within a classroom environment and received further training through videotapes and textbooks. During the intervention, the interviewer participated in weekly supervision sessions with a clinical psychologist. Supervision entailed a number of different activities related to fidelity of treatment and included the following: each participant's progress was discussed, the use of techniques was evaluated, audiotapes were used to critique MI components, and role-play was used to practice MI interviewing for specific situations. An important focus of these supervision sessions was a discussion of differences

between the MI interviewing technique and other frequently used techniques, such as cognitive behavioral techniques.

The MI technique for chronic pain by Jensen [23] was adapted to promote exercise adherence. Table 1 outlines the components of the MI intervention.

Primary outcomes

The fibromyalgia impact questionnaire (FIQ) instrument is a reliable, validated self-assessment measure widely used in clinical trials for FMS [40]. The physical impairment subscale (FIQ–PI) consists of 11 items that inquire about the subject's ability to do 11 different types of physical activity, with each item rated on a four-point Likert-type scale. The scores for the items that the patient has rated are summed and divided by the number of items rated. The average score is then normalized to yield a score range between 0 and 10, where a higher score indicates a negative impact. As a coprimary outcome measure, the FIQ-pain asks about the subject's level of pain over the prior week, with a score range of 0 (no pain) to 10 (very severe pain).

Secondary outcomes

The subjects also completed the brief pain inventory (short form), which measured pain severity during the past 24 h [from 0 (no pain) to 10 (pain as bad as you can imagine)] and interference [from 0 (does not interfere) to 10 (completely interferes)] with general activity, mood, walking ability, normal work, relations with other people, sleep, and enjoyment of life [41, 42]. Multiple measures of pain were included because there is no current consensus about the evaluation of pain in FMS.

Another secondary measure was the arthritis impact measurement scale (AIMS)-depression, a 6-item measure of psychological distress [43, 44]. In two previous FMS studies, AIM-depression was shown to be sensitive to change [45, 46]. An AIMS-depression score of ≥4 is indicative of clinical depression [47].

For exercise adherence, participants were asked to state how many days per week, and how many minutes per day, they engaged in any moderate or vigorous type of exercise in the past 7 days. For this study, exercise was defined as a planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness [48]. The number of days and the number of minutes were multiplied to generate the number of exercise minutes (NEM) per week.

All patients completed the self-administered questionnaires, either online or via mail, at baseline (or week 1), week 12 (immediate post intervention) and week 30 (follow-up). The study was approved by the Indiana University Institutional Review Board (IU-IRB), and all the subjects gave informed consent according to the Declaration of Helsinki.

Statistical analysis

Descriptive statistics were calculated for all continuous primary and secondary outcome variables. For each

Table 1 Components of motivational interviewing intervention

Principles	Strategies
Enhance motivation to exercise	Elicit self-motivational statements that support the following:
	The patient's recognition of the full nature and extent of the problem
	The patient's concern about how he or she is currently managing the problem
	The patient's intention of changing in the direction of adaptive pain management, specifically, exercise
	The patient's optimism that change is possible
Strengthen commitment to exercise	Help the patient develop a plan for change (i.e., shift from why the patient should consider change to how the patient will make changes)
	Communicating free choices
	Reviewing consequences of exercise vs inactivity
	Using a change plan worksheet
	Asking for a commitment
Relapse prevention	Reviewing progress:
	Any and all approximations of progress should be praised and reinforced as much as possible
	Renewing motivation:
	Review behavioral indicators of motivation, as well as the patient's responses to questions concerning reasons for making or maintaining changes
	Renewing commitment:
	Refine the change plan worksheet (if needed) and obtain a commitment to follow through on the new plan

outcome measure for each subject, we computed the change from baseline (week 1) to week 12 (immediate post-intervention) measurements and the change from baseline to week 30 (follow-up). Paired *t* tests were used to compare the primary and secondary outcome variables at baseline with both follow-up assessments.The nonparametric Wilcoxon Signed Rank test was used when the normality assumption for the paired *t* test was not met. Pearson correlation coefficients were used to assess the linear relationship between the change in FIQ (-physical impairment and -pain) and the change in the NEM per week at week 30 from baseline.

Results

Sample participants

Of the 70 patients referred to the study, 21 (30%) enrolled in our pilot project. The remaining 49 patients were excluded because of a pain score of <6 (n=20), lack of interest in the study (n=13), symptomatic cardiac or pulmonary disease (n=5), severe depression (n=9), or already engaged in a regular exercise program (n=2). Of the 21 patients who entered the study, 2 (10%) were lost to follow-up and did not complete the posttreatment questionnaires. There were no differences in the baseline characteristics of those who were lost to follow-up from those who completed the study (data not shown).

Baseline characteristics

The 19 completers were all women, had a mean age of 52.2±9.1 years, mean disease duration of 7.5±5.0 years; 67% were white, 83% had at least a high school education, and 50% were employed. At study entry, 12 (63%) were on opioid analgesics and 9 (47%) were taking either a selective serotonin reuptake inhibitor (SSRI) or a dual serotonin-norepinephrine reuptake inhibitor (SNRI) antidepressant. At baseline, the mean FIQ-pain score was 7.7±1.4, and the mean AIMS-depression score was 5.8±2.8. With a median NEM per week of 0 (interquartile range or IQR: 0 min), the study cohort was relatively inactive.

Treatment outcomes

As compared to baseline, FIQ–PI and pain scores improved significantly at both weeks 12 and 30 (Table 2). Further, BPI-pain intensity and BPI-pain interference paralleled the improvement seen in the FIQ scores at both time points (Fig. 1). Simultaneously, the median NEM per week increased from 0 to 16 min (IQR, 90 min) at week 12 (p=0.004), and to 32 min (IQR: 39 min) at week 30 (p=0.001). Additionally, the proportion of participants who reported doing ≥30 min of exercise per week increased from 15% at baseline to 52% at week 30 (p=0.01). During the 30-week study period, there was a statistically significant correlation between the change from baseline in the NEM per week and the score change in FIQ–PI (r=−0.57, p=0.01), but not with the change in FIQ-pain (r=0.20, p=0.4). The mean AIMS-depression score, which suggested clinical depression for this sample as a whole, was relatively unchanged throughout the study period.

Due to difficulty in time scheduling, six (31.5%) participants completed ≤4 telephone-delivered MI sessions. However, the majority (13 or 68%) finished 5 or 6 phone calls. As compared to participants who had ≤4 phone calls, participants who completed 5 or 6 sessions reported greater reduction (or improvement) in the FIQ–PI[−1.7±1.9 vs −0.3±2.3, p=0.14] and higher NEM per week [median 36 min vs 1.5 min, p=0.05] at week 30. For FIQ-pain, there was no difference between the two subgroups [p=0.4].

During the study, five (26%) subjects started a new FMS-related medication (e.g., SSRI, SNRI, tricyclic antidepressant, anticonvulsant, and muscle relaxant). We noted no statistically significant differences in the means scores for FIQ and BPI between subjects who had a change in their medications versus those who reported no change

Table 2 Mean reduction in the scores of outcome variables at weeks 12 and 30

Outcome variables	Week 1 mean ± SD	Week 12–week 1 mean reduction ± SD	Week 30–week 1 mean reduction ± SD
Primary			
FIQ-pain[a]	7.7±1.4	−2.3±3.2*	−2.6±2.6[b]
FIQ-physical impairment[a]	4.5±2.2	−0.8±1.4*	−1.3±2.1*
Secondary			
BPI-pain severity[a]	7.1±1.8	−2.0±2.8*	−2.4±2.1**
BPI-pain interference[a]	5.9±2.3	−1.5±2.4*	−2.4±2.0**
AIMS-depression[a]	5.7±2.8	0.6±2.6[ns]	−0.3±3.0[ns]

ns non-significant, *FIQ* fibromyalgia impact questionnaire, *BPI* brief pain inventory, *AIMS* arthritis impact measurement scale
[a] Scored from 0 (best health) to 10 (worst health)
*p≤0.01
**p<0.001

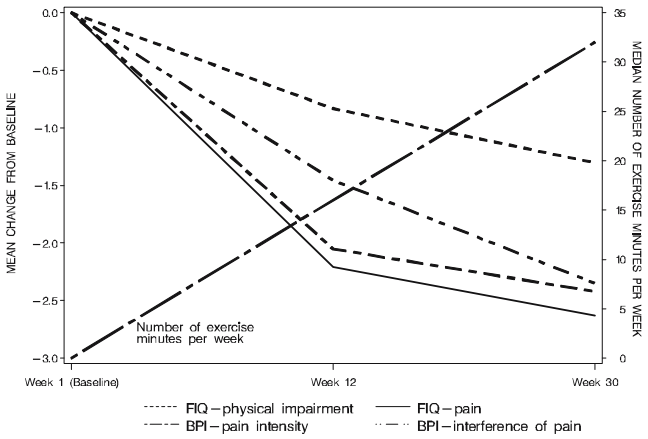

Fig. 1 Changes of outcome measures from baseline to week 30. The *Y*-axis on the *left-hand side* represents the changes in the scores for FIQ-physical impairment, FIQ-pain, BPI-pain intensity and BPI-interference of pain. Notably, all four scales have identical score ranges (i.e., 0 to 10). The *Y*-axis on the *right-hand side* corresponds to the increase in the number of exercise minutes per week from baseline to week 30

(data not shown). None of the 19 subjects had seen a physical therapist during the 30-week study period.

Discussion

In this 30-week uncontrolled pilot study, telephone-delivered exercise-based MI was associated with improvement in self-reported pain severity and physical impairment in patients with FMS. Concurrently, an increase in exercise adherence, as measured by self-report NEM, was noted during the study period. Although participants did not reach the recommended NEM per week (i.e., at least 90 min per week) at week 30, the observed increased NEM per week correlated with improved physical function. Interestingly, the beneficial effects of MI on patient's symptoms were observed despite a lack of improvement in patient's level of depressive symptoms.

In the past 17 years, the FMS exercise literature has largely focused on the 'specifics' of the exercise prescription (i.e., intensity of exercise, pool vs land-based exercise, etc.) associated with symptom improvement [11, 13, 14, 19, 49]. However, adherence to exercise remains problematic. The graduation from a supervised to an unsupervised environment is usually associated with loss of effectiveness because of poor exercise adherence [11, 13–16, 19].

Although exercise-based MI has been used with success among patients in various clinical setting [26, 28, 29], the technique has not been formally tested and reported for patients with chronic pain. Unlike other clinic populations, chronic pain patients are fearful that exercise might trigger their existing pain or result in a new injury or pain site, which can then serve as a barrier to pursue a consistent exercise program. Furthermore, chronic pain has a high rate of comorbidity (≥50%) with depression [50], which may further decrease exercise adherence. Thus, this preliminary evidence that MI can enhance exercise adherence and improve symptoms and functioning in a FMS population with chronic pain and high rates of depression is noteworthy.

In contrast to delivering simple advice, a counselor trained in MI directs patients to examine the pros and cons of participating in regular exercise, and guides them toward resolving any conflicts related to initiating and/or maintaining exercise. Because the patient does most of the talking, MI is patient-centered in that the patient (not the counselor) initiates change and takes responsibility for that change. These key components of MI may explain its success in exercise intervention research.

Our findings should be taken in the context of several limitations. The first major limitation was the absence of a control group. The observed benefits from MI may be explained by regression to the mean or nonspecific effects of providing attention. Obviously, only a randomized controlled trial (RCT) would clarify whether MI has beneficial effects, independent of attention, on patient's symptoms. Despite the limitation (i.e., lack of control group), however, there maybe several reasons to believe MI may have had a specific effect. First, other FMS treatment studies have not shown a placebo effect of a magnitude that would readily explain our results [41, 51, 52]. Second, if the benefits were solely from attention, improvement in patient's mood may have been noted, which was not observed in our study. Third, in the absence of further contacts during the follow-up period, patient reported sustained (or even larger degrees) improvement at week 30.

The self-report nature of our outcome measures was another limitation. The use of an objective measure like a 6-min walk test or aerobic fitness testing or a real-time heart rate recording was beyond the scope of this pilot project. However, in a previous exercise trial, Mannerkorpi et al. [53, 54] found the FIQ–PI to be correlated with improvement in the 6-min walk test. Moreover, pain and functional impairment are the main features of FMS; therefore, patient-reported outcomes remain the principal criteria for assessing treatment effectiveness.

In general, research participants are usually more motivated compared to nonresearch FMS patients. If baseline level of motivation (i.e., how willing and committed the participants were) was associated with improvement in patient's symptoms, selection bias may have influenced the study outcome. Unfortunately, baseline measure of motivation was not collected; thus, we could not assess the relationship of baseline motivation on patient-oriented outcome measures. Nonetheless, it was reassuring to note that only 18.5% (13 out of 70 referred subjects) refused to participate owing to lack of interest.

Despite the above limitations, in the 'real' world clinic setting, exercise-based MI may have potential benefits over and beyond a simple advice from the treating clinician to exercise. Notably, all the enrolled participants in our study had previously received instruction from their private rheumatologists to exercise. Despite such an advice, the study cohort was barely exercising at study entry. In addition, the telephone-administration of MI may also be more doable and more flexible for patients whose schedules do not permit attending in-person counseling and/or supervised exercise programs.

In conclusion, telephone-delivered MI counseling to promote home-based exercise was associated with symptom improvement for FMS patients. Because of the uncontrolled nature of the study, we could not implicate a cause and effect relationship. Therefore, an RCT is indicated to determine its efficacy in FMS. Given the prevalence of FMS and CWP in the general population and the associated disability, effective means to promote sustained exercise could have large individual and societal benefits.

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