Brief pain reprocessing therapy for fibromyalgia: a feasibility, acceptability, and preliminary efficacy pilot

John Sturgeon ,[1] Zina Trost,[2] Yoni K Ashar,[3] Mark A Lumley,[4] Howard Schubiner,[5] Daniel Clauw,[1] Afton L Hassett[1]

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/rapm-2025-107076).

[1]Anesthesiology, University of Michigan Medical School, Ann Arbor, Michigan, USA
[2]Department of Psychological and Brain Sciences, Texas A&M University, College Station, Texas, USA
[3]Department of Medicine, University of Colorado Anschutz Medical Campus School of Medicine, Aurora, Colorado, USA
[4]Department of Psychology, Wayne State University, Detroit, Michigan, USA
[5]Department of Internal Medicine, Michigan State University College of Human Medicine, East Lansing, Michigan, USA

Correspondence to
Dr John Sturgeon;
jsturgeo@med.umich.edu

Received 1 August 2025
Accepted 1 September 2025

Check for updates

© American Society of Regional Anesthesia & Pain Medicine 2025. No commercial re-use. See rights and permissions. Published by BMJ Group.

To cite: Sturgeon J, Trost Z, Ashar YK, *et al*. *Reg Anesth Pain Med* Epub ahead of print: [*please include* Day Month Year]. doi:10.1136/rapm-2025-107076

ABSTRACT

Background Fibromyalgia (FM) is a common, disabling, and costly nociplastic pain condition. Most frontline treatments show modest effects in reducing pain in FM, which may be due to a mismatch between the mechanisms of existing interventions and mechanisms underlying nociplastic pain. The current study was a single-arm, open-label trial examining the feasibility, acceptability, and preliminary efficacy of a novel, three-session telehealth behavioral intervention (Brief Pain Reprocessing Therapy (BPRT)). BPRT incorporates psychological techniques specifically targeting the putative mechanisms of nociplastic pain in a brief, telehealth format.

Methods 35 adults with FM initiated treatment. Participants were asked to complete three one-on-one intervention sessions via telehealth and online questionnaires at four time points (pre-intervention and at 1, 2, and 3 months post-intervention) assessing average pain intensity, pain interference, and pain-related fear.

Results 33 participants (94.3%) completed the BPRT protocol. Acceptability ratings for BPRT were high (62.0 out of 70 on the Treatment Acceptability/Adherence Scale). BPRT completers reported significant reductions in average pain intensity (B=−0.645, 95% CI −0.896 to −0.395, p<0.001; 1-month d=0.56, 2-month d=0.80, 3-month d=0.89), pain interference (B=−2.19, 95% CI −3.06 to −1.31, p<0.001; 1-month d=0.76, 2-month d=1.02, 3-month d=1.06), and pain-related fear (B=−2.29, 95% CI −3.07 to −1.51, p<0.001; 1-month d=0.60, 2-month d=0.88, 3-month d=1.04). At the 3-month follow-up, 42.3% of completers reported being 'much improved' or 'very much improved.'

Conclusions BPRT is feasible and acceptable, with promising preliminary efficacy for reducing pain, pain interference, and pain-related fear in FM. These findings highlight the possibility of reducing FM pain and interference using a brief telehealth intervention. Larger randomized controlled trials are needed to rigorously evaluate the efficacy and mechanisms of BPRT.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Treatment of fibromyalgia (FM) is limited by multiple key issues, including a lack of targeted interventions for nociplastic pain, limited effectiveness of existing interventions in reducing FM-related pain, and high patient burden for important treatments such as behavioral or psychological treatments.

WHAT THIS STUDY ADDS

⇒ This study demonstrates that a brief, telehealth-based behavioral intervention tailored specifically for nociplastic pain (Brief Pain Reprocessing Therapy (BPRT)) is feasible and acceptable and shows promising preliminary efficacy for reducing pain intensity in FM, though large-scale studies to validate its efficacy are needed.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE, OR POLICY

⇒ There is a major need to explore new treatment options for FM and other nociplastic pain conditions, particularly treatments that reduce patient burden and are mechanistically relevant to these conditions. Brief and highly accessible treatments like BPRT have the potential to fill key gaps in pain management, particularly for patients unable to access specialty pain management due to geographic, financial, or time-related limitations.

Fibromyalgia (FM) affects 2–6% of the world's population and is associated with high levels of disability[1 2] and financial burden due to substantial medical utilization[3] and work loss.[4] Unfortunately, frontline pharmacological and behavioral therapies show modest benefits for relieving pain in FM,[5] which may be due to a mismatch between the mechanisms of existing interventions and the pathophysiology of FM. FM is defined as a nociplastic pain condition, meaning that the primary etiology of FM includes alterations in pain and sensory processing in the brain and spinal cord resulting in amplification of pain. Most pain treatments do not specifically target the unique mechanisms underlying nociplastic pain; accordingly, interventions that are designed to specifically target the mechanisms of nociplastic pain may optimize treatment outcomes in FM.

Emerging research suggests one mechanism of nociplastic pain is automatic and prolonged elevations in brain-based threat responses. Prior research in FM has noted elevated levels of hyperreactivity to threat cues,[6 7] impaired affective regulation processes,[8 9] and imbalanced processing of acquisition and extinction of threat learning and elevated expectancies related to the occurrence of pain.[10 11] When these patterns persist, they may predispose perceptual systems toward long-term hyperactive alarm and distress, exacerbating or prolonging

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library.

chronic pain.[12] Accordingly, interventions that address cognitive and affective factors underlying elevated threat processing may be uniquely suited to treat nociplastic pain. A key example of this is Pain Reprocessing Therapy (PRT), which uses pain neuroscience education, graded exposure, strategies for fostering positive emotional states, cognitive reappraisal of the etiology and meaning of pain, and somatically oriented meditation and exposure techniques to foster reductions in fear and pain. A recent trial of a nine-session PRT protocol yielded near-total reductions in pain (ie, post-treatment pain levels of 0/10 or 1/10) in 73% of individuals with nociplastic back pain who completed treatment.[13] PRT has not been examined in FM, despite its status as an index condition of nociplastic pain.

Although behavioral therapies are a cornerstone of pain management, patients face significant obstacles in access, including a dearth of trained providers and high burden associated with attending in-person sessions (eg, travel, long treatment protocols of 8–12 weeks).[14 15] These issues are magnified for patients with limited financial resources, who live in rural areas where specialty pain management resources are limited, and whose symptoms prevent in-person care. However, despite emerging research on brief and telehealth interventions for pain,[15] few studies have tested brief or telehealth-based behavioral treatments targeting nociplastic pain.

Behavioral treatments for FM thus show two key needs: (1) targeted treatments that match the putative pathophysiological mechanisms underlying the disorder and (2) scalable formats of treatment delivery to promote greater patient access. Accordingly, our team developed a brief, three-session behavioral intervention (Brief Pain Reprocessing Therapy (BPRT)) incorporating principles of PRT that can be delivered to patients in a telehealth format. The current paper details the results of a study examining the feasibility, acceptability, and preliminary efficacy of BPRT in 35 adults with FM.

METHODS

The study was pre-registered at ClinicalTrials.gov (registration number NCT06208514; first registered December 18, 2023; first enrolled participant March 4, 2024; final participant enrolled February 10, 2025; https://clinicaltrials.gov/study/NCT06208514). There was no formal involvement of the public or specific patient groups in the design, conduct, or reporting of this pilot study.

Participants

Eligibility criteria included the following:

- Prior physician diagnosis of FM.
- Currently meeting 2016 American College of Rheumatology criteria for fibromyalgia.
- Age 18 years or older.
- Ability to read, write, and speak English.
- Internet access and audio-visual conferencing for Zoom meetings.

Exclusion criteria were as follows:

- Indication of co-occurring (non-FM) causes of chronic pain (eg, inflammatory arthritis, autoimmune disorders, spinal cord injury, cancer).
- Currently receiving psychological therapy for pain.
- Open litigation regarding chronic pain in the prior year.
- Pregnant or breastfeeding.

Procedure

The current study used a single-arm, open-label pilot design. Recruitment was conducted for current patients of Michigan Medicine using the UofMResearch.org website, which lists ongoing clinical research projects. Potential participants indicated their interest through this platform and were contacted for phone screening for study eligibility. If eligible, a study coordinator contacted prospective participants on a separate phone call for consenting, setting up baseline questionnaires, and orientation to the study. All study activities were conducted remotely. Participants were asked to complete internet-based questionnaires at four time points: pre-intervention and at 1, 2, and 3 months after the last completed intervention session. A study flow diagram is in figure 1. Participants were compensated up to US$180 for completing all study activities.

Intervention

Participants were asked to attend weekly BPRT sessions for 3 consecutive weeks delivered on a video conferencing platform (Zoom). Sessions were intended to last 60 min but were scheduled for 90 min to allow for technical or practical issues (eg, internet outages, late arrivals of participants). All intervention sessions were conducted one-on-one by the study Principal Investigator (JS), a pain psychologist who developed the BPRT treatment manual. Participants were permitted to reschedule up to two sessions total; if they failed to complete all three sessions within these five potential sessions, no additional efforts were made for scheduling. Participants who did not complete all three BPRT sessions were not sent post-intervention assessments.

BPRT session content included contemporary pain neuroscience education related to reframing FM pain as a learned and reversible central nervous system-based signal, mindfulness meditation and somatic tracking techniques, positive affect-bolstering techniques (guided imagery, identifying and pursuing personally enjoyable activities), imaginal and in vivo graded exposure to painful stimuli, and goal setting for long-term, independent use of exposure strategies. An outline of session content is included in online supplemental material. Participants were also provided with pre-recorded meditation and imagery exercises to support between-session practices.

Measures

Primary outcomes in this study included feasibility and acceptability of the BPRT intervention. Preliminary efficacy was also measured as a secondary outcome and included change in average pain intensity, pain interference, and pain-related fear.

Feasibility and acceptability

Feasibility was determined by rates of BPRT session completion. Participants were also asked to complete an open-ended assessment about aspects of the intervention that they found helpful, unacceptable, or confusing, as well as soliciting any additional feedback about the intervention, pre-recorded meditation and imagery files, or other aspects of the study. Adverse events were assessed at each post-intervention follow-up assessment using an open-ended form that allowed participants to indicate the presence of an adverse event as well as any details on the nature and severity of this event.

Acceptability was evaluated using the Treatment Acceptability/Adherence Scale (TAAS).[16] The TAAS is a 10-item instrument assessing different aspects of treatment acceptability, including credibility, expectancy, and distress. Items are scaled on a 1–5 Likert scale assessing degree of agreement with each item, and total scores are computed as a sum score of all items. Although research on benchmarks for the TAAS is limited, a cut-off of

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

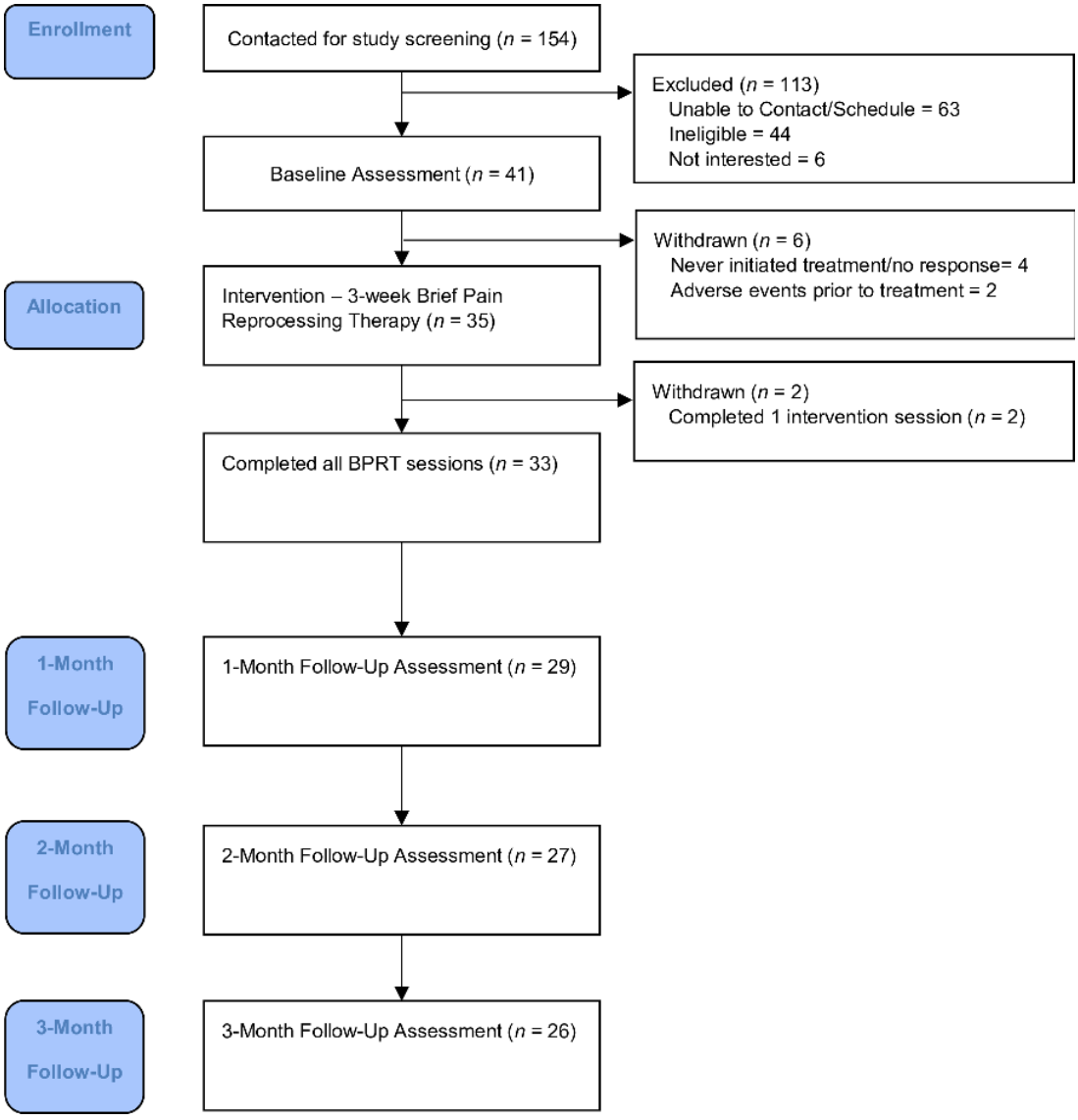

Figure 1 CONSORT flow diagram. BPRT, Brief Pain Reprocessing Therapy; CONSORT, Consolidated Standards of Reporting Trials.

35/70 has been used to denote moderate acceptability in prior behavioral intervention research.[17]

Preliminary efficacy

Average pain intensity was assessed using an 11-point numerical rating scale (NRS; 0–10) for average pain intensity in the past 7 days. This measure has been validated in chronic pain[18] and is a common tool used in clinical trials for chronic pain.[19]

Pain interference was assessed using the Patient-Reported Outcome Measurement Information System (PROMIS) Pain Interference 4-item short form.[20] PROMIS Pain Interference items are summed as a raw score and converted to a T-score (mean=50, SD=10). Higher scores reflect greater levels of pain-related interference. Internal consistency of this scale was high (α=0.909–0.936 across time points).

Pain-related fear was assessed using the 13-item Tampa Scale of Kinesiophobia (TSK).[21] This measure assesses beliefs related to fear of experiencing pain, beliefs about pain as an indicator of ongoing harm to the body, and fear of movement (kinesiophobia). TSK scores are computed as a sum of all 13 items. Internal consistency of the TSK was adequate to high across all time points (α=0.750–0.854 across time points).

Perceived global post-intervention improvement was measured using the Patient Global Impression of Change, a single-item assessment using a 7-point Likert scale (1=very much improved to 7=very much worse). This item has been validated for use in clinical trials for FM.[22]

Statistical analyses

The sample size of 35 was intended to meet or exceed published standards for statistical power in pilot studies.[23] Mean scores were computed and examined to determine feasibility (session attendance) and acceptability (TAAS scores) of BPRT. Demographic differences were examined between completers and non-completers of BPRT using independent-samples t-tests for continuous variables, χ^2 tests for nominal variables, and Fisher's Exact Test for variables with less than five observations per cell (sex, race, and ethnicity). Efficacy outcomes (pain intensity, pain interference, and pain-related fear) were examined using linear mixed models that examined the significance of change in each variable across all included time points. The intervention effect was modeled as a fixed effect of time with a random intercept. Linear mixed models were chosen over repeated-measures analysis of variance as they allow for inclusion of data clusters that

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library . Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

include some degree of missing data. Effect sizes for secondary outcomes were calculated using Becker's d scores in paired t-tests from baseline to each post-intervention time point using the SD of available baseline data for each paired comparison.[24] Small, medium, and large effect sizes correspond to d scores of 0.2, 0.5, and 0.8, respectively.[25] All analyses were conducted in SPSS V.29.0 (IBM Corp., Armonk, New York, USA).

RESULTS

Participant demographics

A total of 154 prospective participants were screened, 41 completed initial questionnaires, and 35 participants ultimately initiated treatment (see figure 1 for study flow diagram). Participant demographics and baseline pain characteristics are in table 1.

Feasibility and acceptability

Of the 35 participants who initiated treatment, 33 successfully completed all three treatment sessions (94.3% of the sample) and 2 participants (5.7%) completed one session. Treatment completers and non-completers did not vary in terms of age ($t(32)=1.20$, $p=0.24$), ethnicity (Fisher's Exact Test $p=0.12$), sex ($\chi^2(1)=0.274$, $p=0.60$), income ($\chi^2(8)=9.22$, $p=0.32$), or education ($\chi^2(6)=3.04$, $p=0.81$), but a race-based difference was noted. Both participants who did not complete all treatment sessions identified as black/African American; accordingly, there was a higher proportion of black/African American participants among non-completers than among treatment completers (Fisher's Exact Test $p=0.010$).

Regarding acceptability, total scores on the TAAS were high ($M=62.0$ out of 70, $SD=6.5$), indicating that most participants found the intervention to be acceptable (see table 2). Furthermore, adverse events were rare (three total). Two participants withdrew prior to initiating BPRT sessions: one participant was withdrawn after a hospitalization for a spinal infection prior to the first BPRT session and another withdrew due to increased psychological distress related to concurrent life stressors. Additionally, one participant reported temporary increases in shoulder pain stemming from completing study questionnaires. All adverse events were unrelated to the intervention, suggesting high tolerability of BPRT.

Qualitative feedback was also gathered from participants who completed all sessions. Most participants (31/33; 93.9%) reported that information presented in BPRT sessions was relevant to their symptoms and that the treatment was understandable. The rate of feedback concerning areas of confusion (two responses) or unacceptability (two responses) was relatively low: one participant indicated that it was difficult to establish a self-guided pain exposure plan due to the sporadic and unpredictable nature of their symptoms, two participants indicated that they did not experience strong responses to guided imagery techniques, and one participant indicated problems with communicating with study staff and getting treatment materials re-sent to them. Open-ended feedback from participants also included a desire for more treatment sessions (three participants), applications of BPRT techniques to fatigue (one participant), scheduling of sessions every other week (one participant), and recommendations to track longer-term outcomes (one participant).

Preliminary efficacy

Among BPRT completers, significant reductions in 7-day average pain intensity (B (SE) = −0.645 (0.126), $p<0.001$, 95% CI −0.896 to −0.395), pain interference (B (SE) =

Table 1 Baseline sample characteristics (N=35)

Variable	n (%) or mean (SD)
Age	44.2 (13.8, 19–70 years)
Gender	
Female	30 (85.7%)
Male	4 (11.4%)
Genderqueer	1 (2.9%)
Sex at birth	
Female	31 (88.6%)
Male	4 (11.4%)
Race	
White	30 (85.7%)
Black	4 (11.4%)
Multiracial	1 (2.9%)
Ethnicity	
Hispanic	2 (5.7%)
Marital status	
Married	12 (34.3%)
Never married	10 (28.6%)
Divorced	10 (28.6%)
Separated	1 (2.9%)
Widowed	2 (5.7%)
Education level	
Less than high school	2 (5.7%)
HS diploma or equivalent	3 (8.6%)
Some college	9 (25.7%)
Vocational degree	2 (5.7%)
Bachelor's	11 (31.4%)
Some graduate/professional school	2 (5.7%)
Graduate/professional degree	6 (17.1%)
Average pain intensity (Numerical Rating Scale)	5.83 (2.12)
Pain interference (PROMIS)	64.0 (6.23)
Pain-related fear (TSK)	31.7 (7.08)

PROMIS, Patient-Reported Outcome Measurement Information System; TSK, Tampa Scale of Kinesiophobia.

Table 2 Item-level acceptability ratings for BPRT (n=33)

Item	Mean (SD), range
If I begin this treatment, I will be able to complete it.	6.32 (0.89), 4–7
If I participated in this treatment, I would be able to adhere to its requirements.	6.39 (0.87), 3–7
I would find this treatment exhausting.	5.77 (1.31), 2–7
It would be distressing for me to participate in this treatment.	6.48 (0.91), 4–7
Overall, I would find this treatment intrusive (invade your privacy).	6.55 (1.16), 2–7
This treatment would provide me effective ways for me to cope with my fibromyalgia symptoms.	6.29 (0.68), 5–7
I would prefer to try another psychological treatment instead of this one.	5.71 (1.46), 1–7
I would prefer to take medication for my fibromyalgia symptoms instead of this treatment.	5.71 (1.49), 2–7
I would recommend this treatment to a friend with a similar problem.	6.45 (0.94), 3–7
If I begin this treatment, I will likely drop out.	6.35 (1.06), 2–7

Items 3, 4, 5, 7, 8, and 10 have been reverse-coded.
All items scaled 1–7, with higher scores suggesting higher acceptability.
BPRT, Brief Pain Reprocessing Therapy.

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library . Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 3 Efficacy outcomes over time among BPRT completers (n=33)

Time	n	Average pain intensity (NRS)	Pain interference (PROMIS)	Pain-related fear (TSK)
Pre-intervention	33	5.72 (2.10)	64.3 (6.41)	31.6 (6.48)
1-month follow-up	29	4.55 (2.05), d=0.56 (0.12 to 1.00)	59.4 (7.81), d=0.76 (0.31 to 1.22)	27.66 (5.22), d=0.60 (0.17 to 1.04)
2-month follow-up	27	3.93 (1.94), d=0.80 (0.24 to 1.37)	57.7 (6.75), d=1.02 (0.43 to 1.62)	25.37 (5.59), d=0.88 (0.25 to 1.53)
3-month follow-up	26	4.04 (2.07), d=0.89 (0.31 to 1.48)	57.5 (7.86), d=1.06 (0.48 to 1.64)	24.38 (5.02), d=1.04 (0.39 to 1.68)

Numbers represent mean (SD), Becker's d, 95% CI.
Effect sizes reflect change from baseline to each follow-up time point only for participants with valid observations at both time points.
BPRT non-completers were not assessed at post-intervention time points.
BPRT, Brief Pain Reprocessing Therapy; NRS, Numerical Rating Scale; PROMIS, Patient-Reported Outcome Measurement Information System; TSK, Tampa Scale of Kinesiophobia.

−0.2.19 (0.441), p<0.001, 95% CI −3.06 to −1.31), and pain-related fear (B (SE) = −2.29 (0.392), p<0.001, 95% CI −3.07 to −1.51) were noted across the study period. Effect sizes were in the moderate range for the primary endpoint (1 month post-intervention) but were in the large range at 2 and 3 months post-intervention (see table 3).

To characterize responders and non-responders to the treatment, percentage reduction in pain symptoms from baseline was also examined. 14 out of 29 participants at 1-month, 14 out of 27 participants at 2-month, and 13 out of 26 participants at 3-month follow-up time points reported reductions of at least 30% pain intensity. A notable number of participants also reported 50% or greater reductions in pain intensity at 1-month (7/29; 24.1%), 2-month (10/27; 37.0%), and 3-month (8/26; 30.8%) follow-up time points. Regarding global ratings of improvement, 20.7% of participants at 1-month follow-up, 25.9% of participants at 2-month follow-up, and 42.3% of participants at 3-month follow-up reported being at least 'much improved' (see table 4).

DISCUSSION

We conducted a single-arm, open-label study to examine the feasibility, acceptability, and preliminary efficacy of a brief behavioral intervention (BPRT) for FM. Overall, our study results were promising. Of 35 enrolled participants, 33 successfully completed the BPRT intervention, suggesting high feasibility of the intervention. Acceptability ratings were high, and qualitative participant feedback was positive, with very few concerns noted about the intervention material or format of delivery.

Although preliminary, our efficacy results suggest that BPRT may have meaningful potential to reduce pain severity and related symptoms in FM. Participants reported moderate-to-large-sized reductions in pain intensity, pain interference, and pain-related fear across all post-intervention time points. Notably, a larger number of participants reported meaningful improvement (in terms of 30% and 50% reduction in pain intensity as well as global impressions of change) at 2 and 3 months post-intervention, suggesting that the therapeutic benefits of BPRT may have grown as participants continued to implement these techniques months after completing treatment rather than diminishing over time.

Our findings are consistent with those from the landmark study of PRT conducted in back pain where robust reductions in pain severity were reported (ie, over 70% of treated participants reported a dramatic reduction in pain severity) but following a much longer intervention (nine sessions).[13] We also found a substantial portion of participants reporting 50%+ pain reduction. Our results are particularly encouraging because the number of studies reporting meaningful improvements in pain severity in FM is relatively small, and because of the brief, scalable nature of our intervention. The current results should be viewed as a promising first step in the application of PRT principles in FM and the testing of a brief format PRT, the two central innovations of the current study.

Limitations

Some framing of these promising effects is needed. First, the current study did not employ a randomized trial design and was instead a single-arm, open-label pilot. All participants received the active intervention (BPRT), and as a result, it is not possible to determine to what degree the post-intervention improvements in pain severity, pain interference, or pain-related fear may have been attributable to the unique aspects of the BPRT intervention as opposed to non-specific effects such as regression to the mean or demand effects. Similarly, the small sample size of this study means that our results were statistically underpowered and validation of our findings in larger samples is needed. It is also worth noting that race was associated with non-completion of the intervention; both participants who did not complete all treatment sessions self-identified as black/African American. Although this finding reflects a relatively small number of overall participants (two out of four participants who self-identified as black/African American in the entire sample), it warrants evaluation in future large-scale studies of BPRT to ensure that the intervention is equally acceptable to individuals of all racial/ethnic backgrounds. Furthermore, given that all intervention sessions were conducted by

Table 4 Patient Global Impression of Change by time point

Time	Very much improved	Much improved	Minimally improved	No change	Minimally worse	Much worse	Very much worse
1-month follow-up	0/29 (0%)	6/29 (20.7%)	18/29 (62.1%)	3/29 (10.3%)	1/29 (3.4%)	0/29 (0%)	1/29 (3.4%)
2-month follow-up	3/27 (11.1%)	4/27 (14.8%)	17/27 (63.0%)	2/27 (7.4%)	1/27 (3.7%)	0/27 (0%)	0/27 (0%)
3-month follow-up	4/26 (15.4%)	7/26 (26.9%)	10/26 (38.5%)	3/26 (11.5%)	1/26 (3.8%)	1/26 (3.8%)	0/26 (0%)

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library . Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

an experienced pain psychologist, it is not clear how generalizable the current effects would be to other interventionists (eg, mental health providers without specific training in chronic pain management). We also did not examine or model the presence of concurrent treatments in our analysis, nor did we ask participants to refrain from initiating new treatments after completing BPRT; as a result, it is possible that some of the positive changes noted in post-intervention time points may not have been solely attributable to BPRT. It should also be noted that our reported findings in tables 3 and 4 included only those participants who provided valid assessments at that time point. It is possible that those with less symptom improvement may have been less likely to respond to these assessments, leading to the possibility that the proportion of participants reporting meaningful symptom improvement may have been somewhat inflated. Taken together, the current results, while promising, should be viewed as preliminary and requiring more rigorous evaluation in large-scale randomized controlled trial designs to account for non-specific treatment effects.

Directions for future research

It is notable that, despite the generally positive outcomes reported on average by participants, the current study results still highlight a significant degree of heterogeneity in treatment response. Approximately half of the participants reported less than 30% improvement at any time point, whereas a smaller subset (24–37%) reported at least 50% improvement in their symptoms. Future studies examining predictors or moderators of response to BPRT would be valuable to inform treatment assignment algorithms. Relatedly, although the theoretical model underlying BPRT targets nociplastic pain, some patients in this sample likely also had nociceptive and neuropathic contributions to their pain, which is typical of FM.[26] Future studies might either test BPRT on patients who have only nociplastic pain or assess the degree of other pain mechanisms in participants and test the implications of this heterogeneity on treatment effects. Furthermore, identification of treatment predictors or moderators would illuminate the ways in which an intervention focused primarily on brain and central nervous system processes may interact with other factors such as psychiatric comorbidity (eg, depression, anxiety, post-traumatic stress disorder)[27 28] or other pain-relevant characteristics like physical activity[29] or sleep disturbance,[28] which were not evaluated in the current analysis. It is also worth noting that our results indicated a degree of non-linear growth over time, with seemingly smaller changes from 1 to 2 months post-treatment than from baseline to 1 month post-treatment. It may be beneficial for future research to examine when the largest treatment responses occur as well as whether BPRT-related improvements persist for longer periods of time (eg, 6 or 12 months).

CONCLUSIONS

The current study highlights that brief, telehealth-based behavioral interventions for nociplastic pain may have considerable value in the treatment of FM. Our results indicate that BPRT was highly feasible and acceptable and showed promising preliminary evidence of efficacy in reducing pain, pain-related interference, and pain-related fear in adults with FM. The shortfall of targeted and accessible behavioral treatments for FM and other nociplastic pain conditions is a meaningful public health problem, and the current study provides a framework for larger studies examining the efficacy of BPRT in FM and other chronic pain conditions.

Acknowledgements The authors would like to acknowledge Kim Bialik, PhD for her input into revisions of the BPRT intervention manual.

Contributors All authors contributed to the conception of the study, interpretation of the analysis results, composition of the manuscript, and subsequent revisions to the study. JS is the guarantor.

Funding This study was funded by National Institute of Neurological Disorders and Stroke (K23 NS125004).

Competing interests Yoni Ashar is a consultant with Lin Health and the Pain Reprocessing Therapy Center. Other authors have no conflicts or competing interests to disclose.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants. The study protocol was approved by the Institutional Review Board at the University of Michigan Medical School (IRB number: HUM00238637). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data from the study are available upon reasonable request.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

ORCID iD

John Sturgeon http://orcid.org/0000-0001-6388-0920

REFERENCES

1 Walitt B, Katz RS, Bergman MJ, *et al*. Three-Quarters of Persons in the US Population Reporting a Clinical Diagnosis of Fibromyalgia Do Not Satisfy Fibromyalgia Criteria: The 2012 National Health Interview Survey. *PLoS One* 2016;11:e0157235.
2 Lage-Hansen PR, Chrysidis S, Amris K, *et al*. Prevalence of survey-based criteria for fibromyalgia and impact on hospital burden: a 7 year follow-up study from an outpatient clinic. *Scand J Rheumatol* 2023;52:539–48.
3 D'Onghia M, Ciaffi J, Ruscitti P, *et al*. The economic burden of fibromyalgia: A systematic literature review. *Semin Arthritis Rheum* 2022;56:152060.
4 Schaefer C, Mann R, Masters ET, *et al*. The Comparative Burden of Chronic Widespread Pain and Fibromyalgia in the United States. *Pain Pract* 2016;16:565–79.
5 Mascarenhas RO, Souza MB, Oliveira MX, *et al*. Association of Therapies With Reduced Pain and Improved Quality of Life in Patients With Fibromyalgia: A Systematic Review and Meta-analysis. *JAMA Intern Med* 2021;181:104–12.
6 Duschek S, Werner NS, Limbert N, *et al*. Attentional bias toward negative information in patients with fibromyalgia syndrome. *Pain Med* 2014;15:603–12.
7 González JL, Mercado F, Barjola P, *et al*. Generalized hypervigilance in fibromyalgia patients: an experimental analysis with the emotional Stroop paradigm. *J Psychosom Res* 2010;69:279–87.
8 Rosselló F, Muñoz MA, Duschek S, *et al*. Affective Modulation of Brain and Autonomic Responses in Patients With Fibromyalgia. *Psychosom Med* 2015;77:721–32.
9 Trucharte A, Leon L, Castillo-Parra G, *et al*. Emotional regulation processes: influence on pain and disability in fibromyalgia patients. *Clin Exp Rheumatol* 2020;38 Suppl 123:40–6.
10 Meulders A, Boddez Y, Blanco F, *et al*. Reduced selective learning in patients with fibromyalgia vs healthy controls. *Pain* 2018;159:1268–76.
11 Sandström A, Ellerbrock I, Tour J, *et al*. Neural correlates of conditioned pain responses in fibromyalgia subjects indicate preferential formation of new pain associations rather than extinction of irrelevant ones. *Pain* 2020;161:2079–88.
12 Pinto AM, Geenen R, Wager TD, *et al*. Emotion regulation and the salience network: a hypothetical integrative model of fibromyalgia. *Nat Rev Rheumatol* 2023;19:44–60.
13 Ashar YK, Gordon A, Schubiner H, *et al*. Effect of Pain Reprocessing Therapy vs Placebo and Usual Care for Patients With Chronic Back Pain: A Randomized Clinical Trial. *JAMA Psychiatry* 2022;79:13–23.
14 Frank JW, Carey E, Nolan C, *et al*. Increased Nonopioid Chronic Pain Treatment in the Veterans Health Administration, 2010-2016. *Pain Med* 2019;20:869–77.

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library . Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

15 Darnall BD, Edwards KA, Courtney RE, *et al*. Innovative treatment formats, technologies, and clinician trainings that improve access to behavioral pain treatment for youth and adults. *Front Pain Res (Lausanne)* 2023;4:1223172.
16 Milosevic I, Levy HC, Alcolado GM, *et al*. The Treatment Acceptability/Adherence Scale: Moving Beyond the Assessment of Treatment Effectiveness. *Cogn Behav Ther* 2015;44:456–69.
17 Soucy JN, Hadjistavropoulos HD. Treatment acceptability and preferences for managing severe health anxiety: Perceptions of internet-delivered cognitive behaviour therapy among primary care patients. *J Behav Ther Exp Psychiatry* 2017;57:14–24.
18 Farrar JT, Young JP, LaMoreaux L, *et al*. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain* 2001;94:149–58.
19 Patel KV, Amtmann D, Jensen MP, *et al*. Clinical outcome assessment in clinical trials of chronic pain treatments. *Pain Rep* 2021;6:e784.
20 Cella D, Choi SW, Condon DM, *et al*. PROMIS® Adult Health Profiles: Efficient Short-Form Measures of Seven Health Domains. *Value Health* 2019;22:537–44.
21 Neblett R, Hartzell MM, Mayer TG, *et al*. Establishing clinically meaningful severity levels for the Tampa Scale for Kinesiophobia (TSK-13). *Eur J Pain* 2016;20:701–10.
22 Geisser ME, Clauw DJ, Strand V, *et al*. Contributions of change in clinical status parameters to Patient Global Impression of Change (PGIC) scores among persons with fibromyalgia treated with milnacipran. *Pain* 2010;149:373–8.
23 Julious SA. Sample size of 12 per group rule of thumb for a pilot study. *Pharm Stat* 2005;4:287–91.
24 Goulet-Pelletier J-C, Cousineau D. A review of effect sizes and their confidence intervals, Part I: The Cohen's d family. *TQMP* 2018;14:242–65.
25 Fritz CO, Morris PE, Richler JJ. Effect size estimates: current use, calculations, and interpretation. *J Exp Psychol Gen* 2012;141:2–18.
26 Wolfe F, Ablin J, Guymer EK, *et al*. The Relation of Physical Comorbidity and Multimorbidity to Fibromyalgia, Widespread Pain, and Fibromyalgia-related Variables. *J Rheumatol* 2020;47:624–31.
27 Häuser W, Galek A, Erbslöh-Möller B, *et al*. Posttraumatic stress disorder in fibromyalgia syndrome: prevalence, temporal relationship between posttraumatic stress and fibromyalgia symptoms, and impact on clinical outcome. *Pain* 2013;154:1216–23.
28 Consoli G, Marazziti D, Ciapparelli A, *et al*. The impact of mood, anxiety, and sleep disorders on fibromyalgia. *Compr Psychiatry* 2012;53:962–7.
29 Vancampfort D, Van Damme T, McGrath RL, *et al*. Physical activity levels among people with fibromyalgia: A systematic review and meta-analysis. *Musculoskeletal Care* 2023;21:623–32.

Reg Anesth Pain Med: first published as 10.1136/rapm-2025-107076 on 18 September 2025. Downloaded from http://rapm.bmj.com/ on September 19, 2025 at Taubman Medical Library . Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.