

RESEARCH ARTICLE

First Use of a Brief 60-second Mindfulness Exercise in an Orthopedic Surgical Practice; Results from a Pilot Study

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Received: 07 March 2017

Accepted: 01 July 2017

Abstract

Background: Mindfulness based interventions may be useful for patients with musculoskeletal conditions in orthopedic surgical practices as adjuncts to medical procedures or alternatives to pain medications. However, typical mindfulness programs are lengthy and impractical in busy surgical practices. We tested the feasibility, acceptability and preliminary effect of a brief, 60-second mindfulness video in reducing pain and negative emotions in patients presenting to an orthopedic surgical practice.

Methods: This was an open pilot study. Twenty participants completed the Numerical Rating Scale to assess pain intensity, the State Anxiety subscale of the State Trait Anxiety Scale to assess state anxiety, and emotional thermometers to assess distress, anxiety, anger and depression immediately prior to and following the mindfulness video exercise. At the end of the exercise patients also answered three questions assessing satisfaction with the mindfulness video.

Results: Feasibility of the mindfulness video was high (100%). Usefulness, satisfaction and usability were also high. Participants showed improvements in state anxiety, pain intensity, distress, anxiety, depression and anger after watching the video. These changes were both statistically significant and clinically meaningful, when such information was available.

Conclusion: People with musculoskeletal pain seeking orthopedic care seem receptive and interested in brief mindfulness exercises that enhance comfort and calm.

Keywords: Mindfulness, Orthopedic, Pain patients, Video intervention

Introduction

Mindfulness based interventions – programs that teach individuals to intently focus their attention on the present moment – help relieve stress, improve pain management and decrease emotional distress and pain intensity (1-3). Mindfulness programs help individuals become aware of and comfortable with thoughts, feelings and bodily sensations, and engage in intentional rather than automatic behaviors.

Mindfulness based interventions represent an unexplored opportunity to help patients in orthopedic surgical practices either as adjunct or as an alternative to medicines and procedures (4). Mindfulness interventions delivered by experts can be successfully incorporated into musculoskeletal care, but most practices do not have these resources at their disposal. Such interventions are lengthy, require a weekly time commitment of 90 to 120

minutes on the part of the patients, and are delivered by trained providers who are unavailable in these settings (5-7). As such, mindfulness based interventions need to be simplified in order to be feasible for incorporation in busy orthopedic practices, and delivered to patients by untrained providers during wait times. Some patients might be motivated to learn more about such exercises and continue using them at home. Brief relaxation and mindfulness interventions have been shown to improve outcomes of surgeries, decrease need for anesthesia during medical procedures, decrease need for medications, as well as decreased self-reported anxiety and fatigue (8-12). However, no such brief interventions have been tested in orthopedic surgical practices. We followed recommendations for intervention development and testing and conducted a feasibility open pilot study, in

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preparation for a subsequent large randomized controlled trial (13). Specifically, we set out to identify whether a brief video 60-second personalized mindfulness exercise is feasible, useful and accepted by patients in an orthopedic surgical practice. We also explored whether the exercise would be associated with reduced state anxiety, pain intensity, distress, anxiety, depression and anger. We hypothesize that the intervention will be feasible as evidenced by over 75% ability to recruit and retain participants, and useful, accepted and usable as evidenced by high scores on a self reported measure of satisfaction. We also hypothesize that patients will experience an immediate improvement in state anxiety, pain intensity, distress, anxiety, depression and anger after watching the 60-second meditation video exercise.

Materials and Methods

Design/Participants

Following institutional review board approval for this pilot study, we recruited 20 consecutive new and follow up patients presenting to the Orthopaedic Hand and Upper Extremity Service at Massachusetts General Hospital in Boston, Massachusetts during one week in April 2016. Participants were excluded if they could not speak English, were 17 years or younger, pregnant, or presenting with untreated severe mental health or substance abuse disorders. The study staff described the study in detail, and obtained written, informed consent prior to any study related procedures.

After informed consent participants completed the following measures: a demographic survey (age, gender, race/ethnicity, work status, marital status, years of education, new or returning patient, illness duration, pain medication type), the Numerical Rating Scale (NRS) for pain intensity, the State Anxiety Subscale of the State Trait Anxiety Index (STAI), and emotional thermometers (distress, depression, anger, and anxiety) (14-17). Next, participants watched a 60-second personalized video (www.pixelthoughts.co). After the video intervention, patients repeated the same battery of questionnaires except the demographic survey. In addition, participants also answered three questions about their satisfaction with the intervention. All measures were collected via the secure REDCAP electronic data capture using encrypted devices. All study procedures occurred before the medical visit.

The 60-second Mindfulness Intervention

The intervention is a personalized 60 seconds meditation available for free, accessed through www.pixelthoughts.co. The opening page features a midnight blue background with moving stars and one large bright star in the middle. Patients are instructed to "Put a stressful thought into the star". Next, patients are instructed to moving star, take a deep breath, and watch the thought getting smaller and smaller. Over the duration of the 60 seconds, the initial large bright star with the stressful thought shrinks and becomes small like the other stars on the screen, guiding patients to see how small the stressful, initially dominating thought

really is in the big scheme of things. In this study, patients were instructed to use a thought associated with their orthopedic musculoskeletal pain complaint.

Measurements

The STAI is a 40-item instrument that contains two subscales to assess state (momentary) anxiety and trait (general) anxiety. We administered the STAI Form Y1, containing 20 items rated on a 4-point scale from 1 (almost never) to 4 (almost always) to assess state anxiety. Scores on the STAI state subscale ranges from 20 to 80 with higher scores indicating higher levels of anxiety (15). Scores are classified as minimal anxiety (20-37), moderate anxiety (38-44), and high anxiety (45-80) with cut off scores at 39-40 to detect clinically significant symptoms (18, 19). There is no established Minimal Clinically Important Difference (MCID) established for this measure.

The Numerical Rating Scale for pain is a commonly used measure of pain intensity that has been validated and reliable across many pain populations (20-23). The NRS is a 1-item, 11-point likert scale assessing pain intensity from 0 (no pain) to 10 (the worst possible pain) (14). A 1-point change is considered MCID for patients with musculoskeletal pain (24).

We used the Emotion Thermometers tool to measure distress, anxiety, depression, and anger. The Emotion Thermometers tool is a validated, reliable instrument, comprised of four emotion domains (distress, anxiety, depression, and anger), each of which is a 1-item 11-point visual analogue scale ranging from 0 to 10 with higher scores indicating greater symptom severity (16, 17). Cut off scores of 2 (distress), 4 (anxiety) and 3 (depression) were established to detect patients with clinically significant symptoms. There is no MCID established for the emotional thermometers (25).

Patients' perception of the overall satisfaction with the intervention was measured by asking patients 3 analogue questions assessing their perceptions on the usefulness of the intervention, satisfaction with the intervention, and likelihood that they would use the video in the future. Questions were answered on an 11-point ordinal scale with high scores depicting greater usefulness, satisfaction, and feasibility.

Patient Demographics

Patients were well balanced in terms of gender (55% women) and had a mean age of 47 ($SD=16$). They were in majority white (75%), and employed (60%). With regard to marital status the majority were either a married or unmarried couple (40%), or never married (40%). Patients had a mean education of 16 years ($SD=2.55$). Fifty five percent of patients were new to the practice. Overall, patients had a mean illness duration of 603 days ($SD=1603$). With regard to pain medication intake, 25% reported taking non-narcotic medications, 15% reported taking narcotic medications, while the majority reported no pain medication intake [Table 1].

Statistical Analyses

We used descriptive statistics to evaluate demographics

Table 1. Descriptive variables of the sample (n= 20)

Variable	M (SD) or N (%)
Age (years)	46.50 (16.29)
Gender	
Female	11 (55%)
Male	9 (45%)
Race/Ethnicity	
White	15 (75%)
Black	3 (15%)
Latino	1 (5%)
Asian	0
Other	1 (5%)
Work Status	
Employed	12 (60%)
Unable to Work	4 (20%)
Out of Work (Unemployed)	0
Other	4 (20%)
Marital Status	
Married or Unmarried Couple	8 (40%)
Never Married	8 (40%)
Divorced or Separated	3 (15%)
Widowed	1 (5%)
Years of Education	15.75 (2.55)
New Patient	11 (55%)
Illness Duration in Days	602.75 (1602.50)
Non-Narcotic Pain Medication	5 (25%)
Narcotic Pain Medication	3 (15%)

Abbreviations: M (SD), Mean (Standard Deviation); N (%), Number (Percentage)

and the main study hypotheses of feasibility, acceptability

and satisfaction. We used Paired Samples t-tests to evaluate pre-post changes in pain intensity, distress, anxiety, depression, anger, and state anxiety using SPSS Statistics (version 22).

Results

Sample selection and attrition

Twenty patients were approached, agreed to participate, and completed consent (100%). All patients met study criteria, completed baseline questionnaires, watched the video and provided post intervention assessments (100%). The video intervention was well received with a mean overall satisfaction score of 20 ($SD=6.9$, range=8-29) [Table 2].

There was a significant difference between new and returning patients on baseline distress thermometer scores ($t=2.5$, $P=0.026$), with returning patients reporting higher scores ($M=4.3$, $SD=2.1$, $n=9$) than new patients ($M=2.3$, $SD=1.6$, $n=11$). There were also significant differences among racial/ethnic groups on baseline state anxiety scores, $F(3,16)=3.4$, $P=0.044$, with Asians reporting highest mean levels of state anxiety (Asians: $M=55$; African American: $M=46$; White: $M=34$; Other race: $M=22$). There were no other significant differences among demographics on outcome variables.

Pearson correlations were used to assess bivariate associations among continuous demographic and main study measures. Illness duration was positively correlated with baseline anger ($r=.51$, $P=0.021$) and state anxiety ($r=.44$, $P=0.053$), such that longer illness duration correlated with higher levels of anger and state anxiety. There were no significant correlations among age or years of education and outcomes variables.

Psychological Outcomes

Patients showed significant improvements in pain intensity and all psychological variables after watching the 60 second personalized mindfulness video, with large effect sizes for all variables, as measured by Cohen's d (Pain intensity: $d=0.92$; Distress: $d=0.90$; Anxiety: $d=1.6$; Depression: $d=1.1$; Anger: $d=1.2$; State anxiety: $d=0.87$). Table 3 depicts complete results. Scores on pain intensity decreased on average by 1.05 points, which was not only statistically significant ($P=0.001$) but also clinically

Table 2. Patient-reported satisfaction with the 60-second personalized mindfulness exercise video

Variable	Question	Mean	SD	Range	
				Min	Max
Usefulness	1. How useful did you find the video?	6.05	2.62	2	10
Satisfaction	2. How satisfied are you with the video that you watched?	7.60	2.16	3	10
Usability	3. How likely are you to use use the video in the future?	7.20	2.38	2	10
Total Satisfaction Score		20.35	6.89	8	29

Abbreviation: SD, Standard Deviation; Min, Minimum; Max, Maximum

Note: Patients were asked to answer the questions on a scale from 0 to 10 with 0 being not useful at all and 10 being very useful for usability, 0 being not satisfied at all and 10 being very satisfied for acceptability and 0 being not likely at all and 10 being very likely for feasibility. Total satisfaction score was calculated by summation of the individual scores for the usability, acceptability and feasibility.

Table 3. Changes in main study variables after participation in the brief mindfulness video intervention

Construct	Measurement Time	Mean	SD	CI of the difference 95%		t score	P value	Effect size
				Lower	Upper			
Pain Intensity	Before Video	3.30	2.56					
	After Video	2.55	2.31					
	Difference	.75	.85	.35	1.15	3.943	.001	0.92
Distress Thermometer	Before Video	3.20	2.04					
	After Video	1.85	2.06					
	Difference	1.35	1.50	.65	2.05	4.034	.001	0.90
Anxiety Thermometer	Before Video	3.80	2.28					
	After Video	1.65	1.73					
	Difference	2.15	1.42	1.48	2.82	6.750	<.001	1.6
Depression Thermometer	Before Video	2.25	2.65					
	After Video	.85	1.53					
	Difference	1.40	1.70	.61	2.19	3.687	.002	1.1
Anger Thermometer	Before Video	2.10	2.17					
	After Video	.65	.93					
	Difference	1.45	1.67	.67	2.23	3.884	.001	1.2
State Anxiety	Before Video	36.55	10.83					
	After Video	28.60	7.65					
	Difference	7.95	9.54	3.49	12.41	3.727	.001	0.87

meaningful. Scores on state anxiety at baseline and post test suggested minimal anxiety and decreased on average by 7.5 points, which was statistically significant.

Scores also decreased significantly on all emotional thermometers from baseline to post video intervention ($P=.001$ - $P=.002$). For Distress, mean scores decreased by 1.35 points and patients as a group moved from "significant distress" to "minimal distress" after watching the video. Symptoms of depression were minimal on average at baseline, and decreased by an average of .85 points. A similar result was obtained for anxiety, where patients had minimal symptoms at baseline which further decreased by 2.15 points. Scores on anger decreased by 1.45 points.

Discussion

The purpose of this study was to assess whether a 60-second mindfulness video exercise was feasible

and acceptable to implement in an orthopedic surgical practice, in preparation for a definitive randomized controlled trial. Secondly we wanted to see whether the exercise will be associated with a decrease in patients' pain and psychological outcomes. We found that the video was both feasible to implement and acceptable to patients. Patients also experienced decreases in state anxiety, pain intensity, distress, anxiety, depression and anger after watching the video. These changes were both statistically significant and clinically meaningful, when such information was available.

Although positive and consistent with the study hypotheses, findings of this research are limited by the small open pilot design with no control group. Consequently, it is unclear whether results are due to the actual exercise, or the additional attention from the study staff. We used the positive results from this study to set up a fully powered randomized controlled

trial comparing the efficacy of the 60 seconds exercise with a brief educational pamphlet attention placebo control in patients presenting to an orthopedics surgical practice. This study is also explored particular patient characteristics that may mediate or moderate findings. Although our study showed immediate momentary decrease in these variables, practice of this brief exercise at home may lead to long term changes and potential improvement in pain and psychosocial outcomes, and future studies should also assess these additional potential benefits.

Nonetheless, results from this pilot study suggest that brief mindfulness interventions could be successfully implemented in surgical clinics. Patients seem receptive and interested in such brief exercises, which may help improve psychological and pain symptoms. This video exercise is a cost-effective, efficient and proactive approach to managing patients' psychological symptoms and pain. Additionally, brief exercises like this one could be useful for pre-operative distress, and could be done both at patients' homes and within hospital settings. Teaching patients skills and providing them with the toolkit to manage their own anxiety and stress can give them a sense of control over their psychosocial symptoms. Research has shown that preoperative mindfulness and mind-body interventions, in concordance with standard of care, are associated with faster recovery time and more cost-effective care (26). Additionally, relaxation response training prior to a breast biopsy was associated

with decreased emotional distress (27). Given the ease and low burden of short mindfulness exercises, and the potential implications they have on patient care, this 60 second video should be further tested for its benefits in clinics.

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