

Perceptions of Myeloproliferative Neoplasm Patients Participating in an Online Yoga Intervention: A Qualitative Study

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Jennifer Huberty, PhD¹, Ryan Eckert, MS², Linda Larkey, PhD¹,
Krisztina Gowin, DO³, Jules Mitchell, MS⁴, and Ruben Mesa, MD²

Abstract

Myeloproliferative neoplasms (MPNs) are rare hematological malignancies with a significant symptom burden often left unresolved despite recent advances in pharmacological therapy. Yoga is a nonpharmacological strategy that has been shown to improve symptoms in other cancers and may be effective for improving symptoms in MPN patients. Online yoga helps address many of the commonly reported barriers of cancer patients to in-person interventions and may make yoga more accessible to MPNs. An exploration of MPN patient perceptions of participation in online yoga is needed to tailor interventions to patient needs and inform future studies. The purpose of this study was to explore the perceptions of MPN patients participating in a 12-week online yoga intervention. This article represents the combined qualitative interview data from two studies. Participants were asked to complete 60 min/wk of online, home-based yoga and were asked to participate in a 15- to 20-minute phone interview postintervention. The qualitative data was coded in NVivo 11 for content analysis. The total sample included 39 MPN patients. Online yoga was well accepted and liked among these patients. They reported physical (eg, improved sleep, reduced fatigue) and mental (eg, reduced stress) health benefits and liked the convenience of being able to do yoga at home. Online yoga provides a feasible and attractive format through which to deliver a nonpharmacological intervention among MPN patients. Randomized controlled trials are needed to confirm the effects of online yoga on MPN patient symptoms. The qualitative findings presented here help inform the development of these future trials.

Keywords

cancer, mindfulness, mind-body, complementary, quality of life

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Introduction

Myeloproliferative neoplasms (MPNs), including polycythemia vera (PV), essential thrombocythemia (ET), and myelofibrosis (MF), are rare hematological malignancies characterized by dysregulated hematopoiesis, significant symptom burden (eg, fatigue, sleep disturbance, depressive symptoms, anxiety, early satiety, pruritus, bone pain), and risk of progression to acute myeloid leukemia.¹ MPNs have a prevalence rate of 86 to 120 per 100 000 people in the United States,² yet MPN is unique to other cancers in that patients often have a favorable life expectancy with as many as 60% of patients living up to 15 years after diagnosis.^{3,4} Much of the current pharmacological treatment focuses on delaying the progression of MPN disease-associated pathology and managing symptom burden. The symptom burden

of MPN patients very often results in a reduced quality of life (QoL), which is reported in as many as 84% of MPN patients.^{5,6} Unfortunately, current standard-of-care pharmacological treatment (ie, medications, phlebotomy, stem cell transplantation) does not fully ameliorate symptom burden.^{7,8} Furthermore, standard-of-care pharmacological treatments (ie, medications/drug therapy, phlebotomy, bone

¹Arizona State University, Phoenix, AZ, USA

²University of Texas San Antonio, San Antonio, TX, USA

³Mayo Clinic Arizona, Phoenix, AZ, USA

⁴Jules Mitchell Yoga, Hermosa Beach, CA, USA

Corresponding Author:

Jennifer Huberty, Exercise Science and Health Promotion, Arizona State University, 500 North 3rd Street, Phoenix, AZ 85004, USA.

Email: Jennifer.huberty@asu.edu



marrow transplant) are associated with increased inactivity, pruritus, fatigue, bone pain, and reduced QoL.⁹

Given the side effects associated with pharmacological interventions, other options are sorely needed to manage unresolved symptom burden among MPN patients. Even so, very little research has been conducted in MPN patients exploring nonpharmacological strategies to manage symptom burden. This is despite a growing body of literature supporting the effectiveness of various nonpharmacological strategies (eg, yoga, tai chi, qi gong, meditation, physical activity) for improving symptom burden in other cancer patients (eg, breast, hematological, lung).¹⁰⁻¹⁶ Yoga, in particular, has gained attention in recent years as an adjunctive approach that can improve distress, anxiety, depression, fatigue, emotional function, social function, sleep quality, and QoL in other cancer patients (ie, breast, lung, pancreatic).^{10,11,13,15}

To begin to meet this need for MPN-specific research, Huberty et al¹⁷ conducted a series of preliminary studies, demonstrating the feasibility of a 12-week online yoga study in MPN patients as well as its preliminary effectiveness for improving symptom burden (ie, reductions in fatigue, sleep disturbance, depression, anxiety, and total symptom score) and a reduction in biomarkers associated with inflammation.¹⁸ These investigators further found that online yoga may be a more feasible option compared with in-person yoga for MPN patients. Patients in these studies reported having to travel outside of their home city (ie, 71% of patients [$n = 20/28$]) or state (ie, 36% of patients [$n = 10/28$]) to receive specialty care, suggesting that many MPN patients may not have easy access to a specialty care facility in which to participate in in-person interventions (ie, in-person yoga). Additionally, participating in online yoga may help MPN patients overcome barriers that are commonly reported by other cancer patients who attend in-person interventions, including fatigue, pain, transportation, and scheduling difficulties.¹⁹ The potential for online yoga to bridge a gap in supportive and adjunctive care for this group of highly dispersed patients, separated from services dedicated to their unique needs, is high, but little is known about the likelihood of uptake and attitudes about online services in this population.

To date, MPN patient perceptions about participation in online interventions has not been explored. This information would be useful in informing future studies for MPN patients and would allow researchers to develop and implement online interventions tailored to the needs of MPN patients. Therefore, the purpose of this study was to explore the perceptions of MPN patients regarding their experience of participating in an online yoga intervention. The qualitative data gathered in this study will be used to inform future studies using online yoga in MPN patients and may also inform the use of online-based interventions in other cancer populations.

Methods

This article represents the combined qualitative interview data gathered from two studies involving MPN patients participating in a 12-week online yoga intervention. The first study was a feasibility study conducted in 2015/2016 in 38 MPN patients (a detailed description of the intervention is published elsewhere).¹⁷ The second was a RCT pilot study (ie, yoga group and wait-list control group) conducted in 2016/2017 in 48 MPN patients (a detailed description of the intervention is published elsewhere).¹⁸

Study Participants

Participants in the feasibility and pilot studies were recruited nationally through organizational partners (eg, MPN Research Foundation, MPN-Net). The research team asked partners to post information about the study on organizations' social media and/or website. Interested MPN patients were directed to an online eligibility questionnaire (via Qualtrics) and were eligible (for both studies unless noted) if they (1) had a diagnosis of ET, PV, or MF identified by the treating physician; (2) answered "no" to all items on the Physical Activity Readiness Questionnaire²⁰ or were willing to obtain a signed release form from their physician if they did answer "yes"; (3) had access to a desktop or laptop on a regular basis; (4) had access to reliable internet; (5) could read and understand English; (6) were 18 years of age or older; and (7) were willing to be randomized to 1 of 2 groups (pilot study only). MPN patients were excluded if they (1) were engaging in ≥ 60 min/wk of yoga, Tai Chi, or Qi Gong; (2) were physically active (ie, ≥ 150 min/wk of moderate-intensity activity); (3) had a history of syncope in the past two months; (4) had a history of recurrent falls (≥ 2 in two months); (5) scored ≥ 15 on the Patient Health Questionnaire-9²¹ indicating moderate-severe levels of depressive symptoms (pilot study only); (6) had an ECOG-3²² score greater than three; (7) were pregnant; or (8) utilized Udaya.com.

Online Yoga Intervention

In both studies, those in the yoga group were asked to complete 60 minutes (two to three 20-minute videos each week) of weekly yoga for 12 weeks. There were additional 5- to 60-minute yoga videos available for participants to complete in addition to the prescribed weekly 60 minutes if they chose to do so. Investigators developed a prescription selected from a video library (Udaya.com) of progressively mild- to moderate-intensity yoga classes based on Hatha and Vinyasa style classes. All videos met the following criteria: (1) rated as either "beginner" or "intermediate" and (2) excluded poses requiring the participant to lie on their stomach (out of concern for an

enlarged spleen or liver). In partnership with Udaya.com, the research team also filmed a total of 6 yoga videos specifically for these studies. Weeks 1 to 2 were based on brief introductory videos (5-20 minutes) demonstrating fundamental yoga poses and safe practice guidelines. Weeks 3 to 12 gradually increased to longer duration videos (20-30 minutes) with slightly increased intensity. All Udaya.com videos included a proper warm-up and cool down, reminders for breathing with the movements/poses, and a closing mindfulness activity with a message from the yoga instructor, brief meditation, and final relaxation. Each week the yoga prescription totaled approximately 60 minutes. However, if participants wished to do more than the prescribed 60 minutes of yoga, they could select a yoga class from the additional videos provided each week. The yoga prescription used in the feasibility and pilot studies were identical, with the exception of meditation-based yoga videos included in the pilot study as additional videos each week. These additional meditation-based videos were included based on study participant feedback from the feasibility study.¹⁷ Participants in both studies were provided with an overview of the yoga prescription, provided detailed instructions on how to access Udaya.com, and told to follow the prescription in the order in which the videos appeared, only going back to previous weeks' yoga videos in case they wanted to participate in a prior class in addition to the weekly prescribed videos.

Procedures

In addition to a set of preintervention and postintervention outcome measures using validated scales for assessing changes in symptoms, all study participants were asked if they were willing to participate in an interview after they completed their postintervention questionnaire. Participants were informed that the interview was not required and that it would take approximately 15-20 minutes to complete if they chose to participate. There was no incentive provided to participants for completing the interview, and all interviews were conducted over the phone. The interview consisted of a preselected set of 10 open-ended questions pertaining to thoughts, feelings, and perceptions of their experiences participating in online yoga. Participants were asked about a variety of topics related to the online yoga intervention, including their (1) perceptions of the impact that online yoga had on their symptoms and overall health, (2) thoughts of yoga before and after the study, (3) likes/dislikes of online yoga, (4) thoughts about the online yoga prescription, (5) thoughts about the instructors teaching online yoga, (6) thoughts about the online-streaming yoga platform (ie, Udaya.com), (7) thoughts surrounding the utility of online yoga for other MPN patients, and (8) thoughts of the intervention as a whole. The questions asked in both

studies were identical, with the exception of question 1 (worded differently). See Table 1 for the 10 interview questions.

Trained graduate- and undergraduate-level research assistants conducted the interviews. Prior to conducting each interview, research assistants explained the purpose of the interview, the length of time that the interview was expected to take, and the voluntary nature of the interview (ie, the participant's ability to skip questions or end the interview at any time). Interview participants were not asked to sign an additional informed consent outside of the informed consent that was signed by participants at the beginning of each respective study. Research assistants used a semi-structured interview script for each interview, asking participants open-ended question, and used additional probe questions as needed to garner further detail from study participants. All interviews were audiorecorded for later transcription.

Qualitative Analysis

Qualitative data analysis was performed by an independent qualitative analysis specialist external to the study team that performed each of the parent yoga studies. The qualitative data from both sets of interviews were combined for the purposes of analysis of content within each question asked and reporting of counts among the most frequent responses within the prompted categories of content and presented in summative style of analysis.^{23,24} All interview transcripts were imported into NVivo 11 for coding. A reflexive thematic analysis method was used,²⁵ with a combination of deductive and inductive identification of themes. Top level themes were first identified relating to the research questions and the main interview questions. Within these top-level themes, emergent themes were identified from the transcripts. The Braun & Clarke method of thematic analysis does not advocate the use of a codebook or multiple coders and interrater reliability scores because these approaches assume that there is a reality in the data that can be captured in the coding process.²⁵ In contrast, this approach to thematic analysis is a more flexible one in which codes emerge through the analysis process. These authors argue that interrater reliability scores only indicate that researchers have been trained to code in the same way and do not reflect the "accuracy" of this process.²⁵ Multiple coders were, therefore, not used in this study, but the reliability of the coding was enhanced by the use of several stages of coding. In these, the allocation and categorization of data to codes was continually reviewed and revised until the analyst felt confident that these most accurately reflected the key themes and sub-themes based on the lived experiences of the research participants. The findings are reported in this article by key

Table 1. Interview Questions.

1. (Feasibility) Now that you have completed 12 weeks of online streaming yoga, in what ways has this experience impacted your quality of life?
- (Pilot) How do you feel that your experience participating in online yoga has impacted you?
2. Before starting this study, what did you think about yoga?
3. Now that you have completed this study, what do you think about yoga?
4. What did you like most about doing yoga online?
5. What did you like least about doing yoga online?
6. What did you think of the yoga prescription?
 - a. Frequency
 - b. Intensity
 - c. Time (ie, 60 minutes per week)
 - d. Any recommendations for change
7. Tell us about your overall rating of Udaya?
 - a. What did you think about videos?
 - b. Instruction?
 - c. Teachers themselves?
 - d. Language?
8. What are your plans for future participation in yoga?
 - a. Will you do online or in-person?
 - b. Will you utilize the discounted membership to Udaya?
 - c. How often will you participate?
 - d. Intensity—What level of class will you participate in?
9. Would you recommend yoga for other MPN cancer patients? Why or why not?
10. If you could change anything about the study what would you have changed?

content emerging from the guided responses to each question and illustrated by verbatim quotes from the interviews. Quantitative counts of the numbers of participants reporting particular types of views on or experiences of the yoga intervention are also included in tables and the narrative. It should be noted that although all study participants were asked the same set of 10 questions, there were probe questions used for a few of the open-ended questions that were asked if a study participant was having trouble answering a particular question or was not understanding the question well. Therefore, not all participants were asked the same probe questions, typical of the nature of qualitative research.²⁶

Results

Characteristics of Study Participants

The total sample included 39 MPN patients, with 21 participating in the feasibility study and 18 participating in the pilot study. Weekly yoga participation averaged 52 ± 27 min/wk and 46 ± 19 min/wk in feasibility study participants and pilot study participants, respectively. Baseline demographics are shown between and across both groups in Table 2.

Perceptions of the Intervention

Physical Health Impacts. Nearly all the participants reported that they had experienced positive impacts on aspects of their physical health as a result of participation in the program, with the most common benefits including increases in physical activity, reductions in fatigue, and improved sleep. Only a minority mentioned that they had experienced negative physical impacts, including pain/discomfort or the yoga routines being tiring or too physically demanding. Table 3 shows the overall numbers of participants reporting different positive and negative impacts on physical health.

The majority of participants ($n = 27$) reported that their overall activity levels had increased because of their participation in the yoga program. Some were already actively participating in a range of physical activities, so the increase resulted mainly from adding the yoga to their existing physical activity levels. Many others, however, reported that they had become more physically active outside the program as a direct result of the more positive mindset or the physical health benefits they had gained from yoga.

On the days that I did the yoga it really sort of it just puts you in the mind of "I should do something because I do feel better when I do something." So I would say it kind of sets the stage for continuing to be active during the day.

It has just encouraged me to be more active in general . . . really take stock on a weekly basis of what kind of things have I done and have I been active and often?

The second most frequently reported physical benefit of the program was reduced fatigue ($n = 20$). Overall, around half of the participants indicated that they thought their symptoms of fatigue had been at least somewhat relieved by their yoga routines. Some reported a more sustained increase in energy levels resulting from yoga participation or indirectly from an improvement in their ability to sleep.

It made me feel better . . . like stronger and like less fatigued. . . I tried to do the yoga first thing in the morning and that seemed to help prolong that feeling of being, you know, not quite so fatigued.

It helped with sleeping . . . between the yoga and wanting to exercise, I think that helped with fatigue. . . The benefits with the fatigue and the sleeping—especially the fatigue, is a huge difference.

Indeed, positive impacts on sleep were the next most frequently mentioned benefit of participation in the program ($n = 16$). Some participants just reported better sleep after practicing yoga, whereas others described more specifically

Table 2. Baseline Demographics and 12-Week Yoga Participation in Those Who Completed an Interview.

	Feasibility Study (n = 21), n (%)	Pilot Study (n = 18), n (%)	Combined (n = 39), n (%)
Age, years (mean ± SD)	60.9 ± 5.7	60 ± 8.7	60 ± 7.2
BMI (mean ± SD)	25.3 ± 4.1	25.9 ± 5.4	25.5 ± 4.7
Gender			
Male	4 (19.0)	1 (5.6)	5
Female	17 (81.0)	17 (94.4)	34
Race			
Caucasian	21 (100.0)	17 (94.4)	38
Other	0 (0.0)	1 (5.6)	1
Diagnosis			
Polycythemia vera	8 (38.0)	8 (44.4)	16
Essential thrombocythemia	7 (33.3)	5 (27.8)	12
Myelofibrosis	6 (28.6)	5 (27.8)	11
Time since diagnosis			
<1 Year ago	0 (0.0)	2 (11.1)	2
1-3 Years ago	6 (28.6)	2 (11.1)	8
>3 Years ago	15 (71.4)	14 (77.8)	29
Education			
High school diploma or less	1 (4.7)	1 (5.6)	2
Some college	1 (4.7)	1 (5.6)	2
Associates/2-year degree	4 (19.0)	1 (5.6)	5
Bachelor's degree	7 (33.3)	9 (50.0)	16
Graduate school or above	8 (38.1)	6 (33.3)	14
Marital status			
Single	0 (0.0)	1 (5.6)	1
Partnered/In a relationship	0 (0.0)	0 (0.0)	0
Married	19 (90.5)	16 (88.9)	35
Separated	0 (0.0)	0 (0.0)	0
Divorced	2 (9.5)	0 (0.0)	2
Widowed	0 (0.0)	1 (5.6)	1
12-Week average yoga participation, min/wk (mean ± SD)	52 ± 27	46 ± 19	49 ± 23

Abbreviation: BMI, body mass index.

Table 3. Numbers of Participants Reporting Positive or Negative Physical Impacts (n = 39).

	Number of Participants
Positive physical impacts	
Increased overall activity levels	27
Reduced fatigue	20
Better sleep	16
Increased strength or energy	14
Greater flexibility	13
Other improved cancer symptoms	10
Positive impact on diet or eating habits	6
Improved breathing	5
Reduced pain	3
Improved posture	2
Improved circulation	2
Feeling better in general	2
Negative physical impacts	
Caused pain or discomfort	11
Tiring or too demanding physically	5

using the breathing or meditation techniques they had learned in the program to help them relax at bedtime in an effort to fall asleep.

I sleep better on days that I do the yoga.

I think I'm sleeping better. . . . And I think probably deeper sleeping too . . . a better stretch of deep sleep.

A considerable number of participants (n = 14) reported that they had more energy or felt stronger as a result of participating in the yoga intervention.

Physically I felt safer. . . . You know, I had to get a bench to put in my shower last spring and that was one of the things I noticed with the yoga, I wasn't using it as much, I had more stamina and I felt safer. You know, because I felt more balanced.

That's the thing I noticed the most, I felt stronger, but my balance improved a great deal.

Another physical benefit reported by many of the participants (n = 13) was greater flexibility.

When I sit for any length of time, I get very stiff. So, yoga really does help with that. Not only, you know, does it make you limber for the time you're doing it, but it lasts for hours afterwards. I think that for me is huge from a physical point of view.

A smaller numbers of participants reported other types of physical benefits experienced as a result of the yoga intervention, including reduced pain, easier breathing, improved circulation, improved eating habits, positive impacts on specific symptoms of MPN, or just feeling better or more health conscious in general. It should also be noted, however, that many of the positive physical impacts of the program that were reported by some of the participants were not reported by others. In particular, relatively few participants reported any impact of the yoga on their diet or eating habits, with 21/39 participants saying that there had been no change in this aspect of their lifestyle since participating in the program. Some also mentioned that they had not noticed any impact on their cancer symptoms (n = 9) or on their levels of physical activity in general (n = 4).

Mental Health Impacts. Overall, fewer mental health benefits were reported from the yoga compared with physical health benefits, but a considerable number of participants did report at least some positive impacts of the program on aspects of their mental health. Only 2 participants indicated that they had experienced any form of negative impact of yoga participation on their mental health, one citing the stress of participating in a new program, which eased over time, and the other mentioning that they were made to feel “inadequate” when unable to cope with the physical demands of the yoga classes. Table 4 shows the overall numbers of participants reporting various types of positive impacts on their mental health.

A reduction in stress or improved ability to calm one's mind was the mental health benefit reported by the greatest number of participants (n = 14). The responses indicated that these benefits resulted from the meditation-focused videos in particular. Some participants indicated that learning to meditate had been the primary benefit of participating in the program, even if they struggled to cope with the physically demanding yoga classes. Many viewed this as especially helpful in enabling them to better manage the stress and anxiety they often experienced resulting from their MPN.

The meditation was very, very excellent in, in getting my anxiety level down ... regarding my health and my condition and so forth.

I think I used it to calm my mind (when) anxious about upcoming tasks, or results of tests how they turned out. . . . I used it to calm my mind and I really enjoyed, really enjoyed that.

Table 4. Numbers of Participants Reporting Positive Mental Health Impacts (n = 39).

	Number of Participants
Positive mental health impacts	
Calming mind/Reducing stress	14
Improving self-image or self-confidence	13
General sense of well-being/enjoyment	7
Improving social relationships	7
Improved mood or reduced depression	4
Improved self-discipline or time management	4
Increased overall use of wellness practices	4
Improved memory or mental strength	2
Improved outlook on medical condition	5

Beyond a reduction in stress, however, nearly a third of participants (n = 13) described ways in which yoga participation had a positive impact on their self-image, self-confidence, or as one described it, “self-worth.” This appeared to arise from feeling a sense of accomplishment from completing the yoga or the feeling of satisfaction that they are taking control over an aspect of their lives and not being defeated by their condition.

It's been very positive. Every time I did it, I would feel really good about myself and about doing it.

When you have a chronic illness . . . it's really easy to fall into the trap of thinking that's me. And you lose sight of the fact that there's a whole lot of you, and I can find a way to tap into that and realize that you're still strong in ways, it's really good. . . . It requires you to do things that you just aren't asking of yourself on a daily basis. And to find out you can be successful at that, it's far more than “Oh, think of the positive,” it's “Oh, I do have control over this to some degree.”

Some participants (n = 7) referred to a general sense of well-being and enjoyment of the yoga sessions. This was clearly beneficial to their general state of mental health at least while practicing the yoga and, for some, appeared to contribute to a more positive mindset in general. Being happier and more relaxed may at least partly help explain why some participants (n = 7) also reported an improvement in their relationships with other people, as reflected in the following quotes:

I did feel that every time I did finish one of the sessions like I did really accomplish something and it put me in a better mood and I'm sure that showed when I spoke to people.

I think it helped me to remember to breathe and stuff during stressful times so I think in a roundabout way it helped in how I deal with others and other situations.

A few participants reported other types of psychological benefits experienced as a result of the yoga intervention,

including reduced depression or improved mood, enhanced ability to deal with their condition and symptoms, or a positive impact on self-discipline and accountability. For example,

I was pissed off about this disease and the treatment being almost as bad, and blah blah blah. . . . I guess yoga really does help with anger, because I'm not pissed off anymore.

I think some of the side effects that it helped alleviate, made the day-to-day a lot easier.

However, others did not report the mental health benefits reported by some research participants. A considerable number of participants indicated that they had noticed no impact of program participation on their relationships with others (n = 14) or on their own self-image (n = 10).

Postintervention Yoga Perceptions. The majority of participants (n = 26) expressed the view that their impression of yoga had improved since participating in the program, even though many of them had already held positive views on yoga before the intervention. Many of their responses suggested that the program had provided them with a deeper or more informed understanding of what yoga involves, including both meditation and physical postures.

It's like it's a whole new world to me this time, you know . . . because it's really not about the physical poses, it's really about the mindfulness and the breathing and the connection to something outside of yourself.

Some mentioned other factors such as the quality of the videos, being able to follow the program within their own home, and finding relief from physical symptoms, as having an influence on their overall postintervention impression of yoga.

I think in the past because I have not found streaming yoga videos that I felt really engaged me and kept me wanting to do more. I really didn't think it was a way to engage in yoga, that it needed to be in person. But I actually like the Udaya site so much that with this kind of yoga, online yoga can be useful. I actually think I will do more of it in the future.

I didn't know that it would help me with my knees so much and I've talked to other people my age, people always talk about their having sore knees and I tell them, you may wanna try some yoga. . . . I've done physical therapy and that helped, but the yoga helped even more.

A minority of participants (n = 4) expressed the view, having completed the intervention, that the yoga routines were harder than expected. Four participants indicated that although they had enjoyed the online yoga, they would prefer to attend an in-person class rather than practicing at home.

Table 5. Main Likes and Dislikes About Online Yoga, by Numbers of Participants (n = 39).

	Number of Participants
Likes	
Time flexibility/Convenience	21
Variety/Flexibility of routines	21
Convenience of place	15
Opportunities for meditation/relaxation	14
Being able to repeat the same routines	10
Privacy	9
Ease of use	5
Low cost	3
Other/General likes	11
Dislikes	
Lack of feedback/accountability	16
Visual difficulties in following routines	13
Technical computer-related difficulties	11
Routines too hard or caused pain	9
Difficult to find suitable time or space	8
Miss the social interaction of a class	4
The need for equipment	3
Unable to achieve desired spiritual state	2
Other dislikes	2

Yoga Intervention Likes and Dislikes. Participants reported a range of likes and dislikes regarding the yoga intervention. Although there were a greater total number of likes mentioned, there were also a variety of commonly cited dislikes of the yoga intervention. Table 5 shows the range of factors that emerged from the interviews in response to the questions asking about likes and dislikes of online yoga.

A large number of participants (n = 21) expressed that what they liked best about online yoga was the ability to undertake the routines at times most convenient to them and the ease of fitting them into a busy schedule. Some explained that they work full time and that online yoga enables them to participate around their working hours, whereas others reported that the short yoga sessions offered by the program are easier to fit in and benefit from than an hour-long class.

I liked definitely the flexibility. You can do it whenever 'cause my work schedule is really crazy and you know maybe I only have time at 6 o'clock in the morning or maybe I have time at you know 10 o'clock at night.

I like the flexibility of doing it when I had time. When it was convenient for me was probably the best thing about doing it online.

The other main factor that participants reported liking best about online yoga is the variety and flexibility of routines available to them, which enables them to tailor their yoga participation to their own circumstances or available

time. A total of 21 participants indicated that they liked this aspect of online yoga, explaining for example that they could opt for an easier or more challenging routine depending on their physical limitations or energy level, or could select shorter videos to suit their available time.

I liked that flexibility and not just being stuck with one particular routine—that you could go back and try a whole bunch of different ones. You know, if you didn't feel like going super hard today, you could do something a little more relaxing.

I would say that there's something in there for everyone, you know? Everyone at every level really.

In all, 15 participants indicated that one of the things they liked most about online yoga was the convenience of being able to participate at home or, for some, in another convenient location when traveling. Those participants who appreciated the ability to practice yoga at home included older people, those whose MPN condition restricts their ability to attend an in-person class, and those living in a rural area with limited opportunities locally to attend classes.

Living in an extremely rural area it's a great alternative.

I'm older, and I would not have gone to a yoga studio. . . . Doing it online, at home, was a good way for me to be introduced to yoga.

The next most popular factor cited by participants ($n = 14$) when expressing what they liked best about online yoga was the opportunities it offered for meditation or relaxation. Before participating in the program, some had been unaware of these potential benefits of yoga. The responses indicated that this benefit was valued because it enabled the participants to cope better with the stress involved in having MPN cancer and contributed to better sleep as well as giving them an opportunity for some quiet “me-time.”

The meditating, the relaxing, I loved the ends of every part of every, you know, the video because you always had a chance to just focus on you. So that was probably my favorite part of the whole thing. . . . Because a lot of the symptoms that we experience are very muddled so just finding a way to, to just kind of put them out of your head is, it, that's a good thing to have, that's a good trick to have.

A total of 10 participants indicated that one of the things they liked best about online yoga was being able to rewind and repeat the same routines. Some explained that this made it easier to learn the routines by practicing them over and over, whereas others said that they often chose to repeat routines that they particularly enjoyed.

Cause ya know you can always play it over again if you missed, absolutely. It was terrific. . . . you can stop it any time you want

to. Pause it, ya know, you can make changes, so adjust it to your own self.

As we came towards the end, I just kind of started going back and redoing classes that I really liked. And that I felt really helped me for the given moment.

Another factor that several participants ($n = 9$) said they liked about online yoga was the opportunity to practice in the privacy of their own home. These participants were mostly those who had not practiced yoga before and felt self-conscious about their inexperience or their body shape.

It's more private 'cause I'm not in the best shape. . . . I never would have done it in a classroom. . . . It made me want to try because I knew no one was looking at me.

I am not very well coordinated so I'd be embarrassed to be in front of a group of people.

Although the majority of participants expressed views indicating that they were very happy with their experiences of participating in online yoga, there were also aspects of online yoga that some participants disliked. Of these, the most frequently cited factors were (1) the lack of a live instructor ($n = 16$); (2) the need to watch the videos via a desktop or laptop computer ($n = 13$); (3) the technical problems experienced when trying to access the site (ie, Udaya.com), stream videos, or submit data for their yoga participation logs ($n = 11$); (4) the routines being too hard for them or causing them pain ($n = 9$); (5) difficulty finding a suitable time or space to participate in the online yoga ($n = 8$); and (6) the lack of social interaction or sense of community in an online class setting ($n = 4$).

I think it's the motivation factor; it's hard for me to get motivated to do it when it's just going to be me and it's online and I don't have that buddy to, you know, get you to class.

I don't know if it was my wife or what but there were a lot of videos that would like just freeze up, umm, so sometimes that was a little frustrating.

I couldn't do any of the bending over stuff, so I couldn't even do the downward dogs and that kind of stuff. Physically I could do it, flexible wise I could do it. I wanted to do it, but it hurt my spleen.

I couldn't do anything where I was getting up off the floor to a standing position without having assistance. . . . So that made a lot of them impossible for me to do. . . . I couldn't do staying in down dog position more than a few seconds without my wrists really hurting or my feet.

As much as yoga is very internal, there is a community aspect in a class. That has nothing to do with talking between yourselves, or looking, it's just that community spirit feeling that's a really powerful thing.

Perceptions of Yoga Prescription. When asked for their views on the overall time requirement (ie, 60 min/wk), participants indicated that they felt that this was appropriate and not too easy or challenging to meet (n = 13). Many of these participants also mentioned that they liked the flexibility of being able to divide up the time as they wished.

I think the 60 minutes a week was a good goal, 'cause a couple times it was difficult, a couple times it was easy.

I think an hour a week is probably perfect because you could break it down into smaller segments. Or, me the procrastinator, I knew Saturday morning I don't go to work until Saturday afternoon, so I'll just do an hour of yoga because I didn't get to it.

In contrast, 6 participants expressed the view that the weekly time requirement is too low and that it should be increased.

I thought that it should've been more, it just didn't seem like enough for a week.

60 minutes got too little at the end. So they maybe by week 8? They should've had to do 90 minutes. . . . I wound up doing more because it felt like you needed to do more. Or you wanted to do more. Same with exercise, once you start walking, your body tends to want to do it.

One expressed the view that this is necessary to get the full benefit of the program by trying all the recommended yoga routines, whereas another pointed out that they would have been more motivated to increase the time spent on the yoga routines if it had been a study requirement.

Sixty minutes in one week is kind of minimal. It's better than nothing. I was usually doing an hour and a half to 3 hours a week because I really wanted to experience the whole thing. . . . I could see if you were only doing an hour a week, you wouldn't be able to experience many videos and might not get the full benefit of the practice.

I think that if it was the requirement to do more, I would have probably pushed myself a little more and done a little more.

Some acknowledged, however, that having an easily achievable target of 60 minutes helped motivate them to get started on the yoga and would encourage more people to participate in the study.

For me it was too little. Um although going into the study knowing that I only had to commit to doing sixty minutes a week was a good thing. . . . So it was kind of uh both ways but once I started doing it like I say, I instantly felt like I wanted to and could do more. But having the sixty minutes is a good baseline.

Several individuals (n = 5) described difficulties in meeting the minimum weekly time requirements at least some of the time because of factors such as ill health, physical limitations, or pressures on their available time.

Every other weekend I work all night long and then I take 4 days to recover from that. And so in those weeks it was a struggle to get 60 minutes.

There was a couple times that I didn't get the full hour done. . . . I'd caught a cold when I was sick, I was down for about two weeks.

Of those participants who expressed a view on the intensity of the videos (ie, all videos included in prescription were rated as "beginner" or "intermediate" on Udaya.com), a considerable number indicated that they thought at least some were too hard (n = 14), especially for many MPN patients, or were too difficult in general for older or unfit people (n = 6).

I feel like I'm in probably a lot better shape than a lot of other people with my illness. . . . and I don't see how some people can even do some of the videos. Because it just took so much upper body strength.

When you're sixty or over you will find that you cannot stand on one foot, put your hand on the ground, and put the other foot in the air. You just can't do it. Well if you can, then you've probably been doing yoga forever and you don't need to do this.

Only a small number of participants (n = 3) made the point that they felt the videos offered a suitable range of intensity levels for MPN patients and that the progression from easier to harder videos throughout the program was appropriate.

I thought it was spot on. Especially for someone who is coming back into it . . . there's certainly enough of a progression from week 1 to week 12 in terms of, complexity. . . . I would say that there's something in there for everyone, you know? Everyone at every level, really.

It seems to build intensity and then you had an option of beginner versus intermediate, so you got to choose which one you were at. So I thought that the progression of intensity was great.

Future Yoga Participation. Having taken part in the intervention, the research participants were asked about their plans for future participation in yoga, either online or by attending a class in person. A total of 13 participants reported that they will definitely or probably continue with online or other home-based forms of yoga, and some of these were already continuing with the Udaya program or had purchased the DVDs. The types of reasons that were cited for

choosing home-based yoga rather than a class included lower cost, convenience, and privacy. Only one participant responded that they would be unlikely to continue with yoga. Nine participants, however, said that although they planned to continue with yoga, they intended to do this in a class, and several had already signed up or made inquiries about available yoga classes in their local area. The main reasons reported for choosing to attend a yoga class in-person rather than continuing with online yoga were a preference to have a live instructor who would give them feedback or the lower cost involved if yoga classes were included in an existing gym membership. Some participants ($n = 11$) also expressed a general intention to continue with yoga in some form but did not express a particular preference for either online yoga or in-person classes.

Recommendations for Other MPN Patients. The participants were asked whether, following their involvement in the intervention, they would recommend yoga for other MPN cancer patients and to explain their answer. More than half of the sample ($n = 24$) indicated that they would recommend yoga to other MPN patients, and a further 11 individuals indicated that they would do so with certain caveats. None of the participants said that they would definitely not recommend yoga to other MPN patients.

Many of the participants stressed that they would recommend yoga for anyone, not just MPN patients. More specifically, the types of reasons cited for recommending yoga to other MPN patients included the ability to reduce stress and fatigue, keep fit, and develop a more positive mindset about their condition.

I think you need it because the stress factor with this disease is off the charts—because of the no-cure part of it. So the yoga helps with the meditation and you should learn how to breathe and you should be learning all of that.

I would strongly recommend it to anyone who was diagnosed with this because it does, if nothing else it just makes you feel like you have accomplished something and there are days when you don't have many things like that.

The 11 participants who stated that they would recommend yoga for MPN patients only with certain caveats explained, for example, that it would depend on the individual's state of health and pain. Participants also stressed the importance of having good instruction and only following routines suited to the patient's own symptoms and fitness level.

Discussion

The purpose of this study was to describe the perceptions of MPN patients' experiences and attitudes regarding participation in an online yoga intervention. The qualitative data

gathered in this study may be used to inform future studies using online yoga in MPN patients. In general, there was an overwhelmingly positive response to online yoga among MPN patients, with positive physical and mental health benefits cited, positive perceptions toward the online format of yoga intervention delivery and the yoga prescription as a whole, and an interest in future yoga participation among the MPN patients who participated in this qualitative study. Despite the positive perceptions cited by MPN patients, however, there were also some negative perceptions and feelings regarding the yoga intervention's format. A discussion of both MPN patient perspectives is included in the following sections.

Positive Perceptions of Online Yoga

MPN patients reported a wide range of physical health benefits, of which increased physical activity levels, reduced fatigue, and better sleep were the three most common. These reported benefits are very exciting because these are also some of the most commonly reported symptoms that MPN patients experience.^{1,5} The reported improvements in sleep and fatigue align with the findings of a feasibility study¹⁷ in which 12 weeks of online yoga was found to elicit improvements in both fatigue and sleep disturbances (among other symptoms) in MPN patients. Additionally, inactivity among MPN patients is common (~61% of patients report inactivity),²⁷ so self-reported increases in overall activity levels is a promising initial finding as well.

It is interesting that some patients reported that the use of meditation helped them relax and fall asleep. Recently, evidence has mounted suggesting that meditation can help alleviate sleep disturbances in cancer patients.^{28,29} Additionally, MPN patients also cited the meditative aspect of the intervention to help them in reducing stress and "calming their mind." MPN patients, as well as other cancer patients, often demonstrate increased levels of stress and anxiety,^{1,30} so it is promising to find that the most commonly reported mental health benefit was a reduction in stress or a "calming of the mind." It has been demonstrated that meditation can reduce stress in cancer populations,³¹ and findings of the present study provide some preliminary support for the benefits of meditation for reducing stress in MPN patients specifically. Future studies may look to compare meditation versus yoga and their effects on sleep disturbance and stress in MPN patients to better determine if the reductions in sleep disturbance and anxiety are because of yoga (as a whole) or because of the individual component of meditation/mindfulness.

The most common reasons cited for liking online yoga included the time flexibility/convenience aspect of it, the variety and flexibility of the yoga routines, and the convenience of being able to do it at home. These reported "likes" of online yoga are notable because they address some of the

barriers reported by cancer patients to participating in in-person interventions (ie, transportation and scheduling difficulties).¹⁹ The ability to participate in online yoga in one's own home at whatever time is convenient because it eliminates transportation and time management as barriers, which are typically reported by those participating in yoga classes at a studio, clinic, or academic institution. The convenience of doing yoga at home also addresses MPN patients' limited access to in-person interventions at their treating facility. Many MPN patients travel outside of their home city or state to receive treatment,¹⁷ and having access to an online yoga intervention allows MPN patients access to much-needed resources for symptom management.

The convenience of doing online yoga at home makes online yoga a potentially attractive method of delivery for other cancers. Prior research has demonstrated the benefits of yoga for other cancer patients, including breast, lung, and pancreatic cancers.^{10,11,13,15} Cancer patients have reported that fatigue, pain, transportation, and scheduling difficulties are limitations to participating in in-person interventions. Therefore, online yoga could be used in other cancers in addition to MPNs to help address some of these barriers and to give cancer patients access to yoga. Future research should investigate the feasibility and effectiveness of online yoga in other cancers.

Negative Perceptions of Online Yoga

There were a few cited negative effects of participating in online yoga. The negative impacts that MPN patients reported were related to the yoga intervention causing pain/discomfort and it being tiring or difficult. It is important to note that there was only one reported adverse event in both the studies from which these qualitative data came (ie, aggravated enlarged spleen),¹⁷ which was resolved without further incident by providing recommendations for modifications to yoga poses for this participant. It could have been that the yoga videos selected for the intervention were too difficult for some participants because nine participants reported that a "dislike" of the yoga intervention was that it was too hard or caused pain. Further modifications to the yoga prescription and the inclusion of lower-intensity classes or the development of more MPN-specific yoga videos to include within the yoga prescription may help address this issue in the future.

Another dislike reported by study participants included lack of accountability and feedback. Research suggests that the addition of group dynamics, or social support components, to physical activity-related interventions helps increase adherence and participant engagement.^{32,33} One of the participants in this study shared that an online forum would be a way to communicate with other study participants and to gain a greater sense of "community" among all study participants. In a 12-week feasibility study for online yoga,¹⁷ 82% (n = 23/28) of MPN patients reported being

interested in an online forum to supplement online yoga. The addition of an online forum may have provided participants in this study an opportunity to interact with each other and provide accountability to each other. This added component could have also allowed participants to receive feedback from research staff, all of which may enhance the participant's experience with the intervention and improve engagement.³⁴

Finally, study participants found that they had visual difficulties in following the yoga routines and technical computer-related issues that caused them trouble during the streaming of yoga videos. Study participants were instructed to view the yoga classes on their laptop with their home internet connection. Many study participants found it difficult to participate in the classes while trying to view the instructor in the videos demonstrating the poses because of the small size of their laptop screen. Additionally, connectivity issues left many study participants experiencing issues related to the videos buffering in the middle of a class. Future studies utilizing online-streaming yoga videos could have study participants download videos onto their laptop prior to viewing them, so that connectivity does not become an issue in the middle of viewing a class. Additionally, a list of options or recommendations for the best way(s) to view the yoga videos online can be provided to participants before they begin practicing yoga (ie, hooking up laptop to TV with HDMI cable, using a tablet or smartphone to stream videos, so that it can be moved around while doing poses, etc).

Future Yoga Participation and Recommendations for Other MPN Patients

In general, it seemed that MPN patients enjoyed participating in yoga or found some value in it because more than half of the participants (n = 24/39) had an intention to continue participating in yoga of some form, and nearly all (n = 35/39) recommended yoga for other MPN cancer patients. Some of the reasons cited for recommending yoga for other MPN patients, including to reduce stress and fatigue and to develop a more positive mindset about their MPN condition, align with commonly reported issues among the MPN patient population. Approximately 50% to 60% of MPN patients report that their fatigue is severe and ~74% to 91% of patients report that they feel anxious or worried about their MPN.³⁵ Based on the feedback received from this MPN subsample, yoga may be a useful complementary therapy for MPN patients to use for managing fatigue and for reducing stress and improving mindset surrounding MPN.

Limitations

The primary limitation in the present study was an overrepresentation of women and those who had prior yoga experience when compared with the typical MPN patient

population. The study sample in the present study was primarily female ($n = 34/39$), and a larger proportion of participants reported some form of prior yoga experience ($n = 25/39$). The typical MPN patient population is ~53% female and only ~26% to 40% of MPN patients report participating in yoga.³⁶⁻³⁸ This limits the ability to generalize the findings of the present study to all MPN patients. Additionally, study participants in each of the parent 12-week yoga studies were asked to participate in an interview only after completing all 12 weeks of online yoga. Therefore, our interview sample may not be representative of our study sample across both online yoga studies because those who dropped out were not ever asked to participate in an interview.

Conclusions

Among a sample of MPN patients, 12 weeks of online yoga was well accepted and liked. MPN patients reported physical (eg, improved sleep, reduced fatigue) and mental health (eg, reduced stress) benefits and liked the convenience and flexibility of being able to do yoga at home. There were, however, some negative perceptions of online yoga mentioned by some study participants (eg, difficulty of yoga classes, lack of feedback and accountability, technical issues with online streaming of videos) that could be resolved in future studies using online yoga in MPN patients. Online yoga provides an attractive format through which to deliver a nonpharmacological intervention for symptom management among MPN patients. Randomized controlled trials are needed to confirm the effects of online yoga on MPN patient symptom burden, and the qualitative findings from this study may help inform the development and design of these future trials in MPN patients and across other cancers.

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