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*Original Article*

# Iyengar Yoga for Young Adults with Rheumatoid Arthritis: Results From a Mixed-Methods Pilot Study

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## **Abstract**

**Context.** Rheumatoid arthritis (RA) is a chronic disease that often impacts patient's quality of life. For young people with RA, there is a need for rehabilitative approaches that have been shown to be safe and to lead to improved functioning.

**Objectives.** This pilot study investigated the feasibility of a single-arm, group-administered, six-week, biweekly Iyengar yoga (IY) program for eight young adults with RA.

**Methods.** IY is known for its use of props, therapeutic sequences designed for patient populations, emphasis on alignment, and a rigorous teacher training. Treatment outcomes were evaluated using a mixed-methods approach that combined quantitative results from standardized questionnaires and qualitative interviews with participants.

**Results.** Initial attrition was 37% ( $n = 3$ ) after the first week because of scheduling conflicts and a prior non-RA related injury. However, the remaining participants ( $n = 5$ ) completed between 75% and 100% of treatment sessions (mean = 95%). No adverse events were reported. The quantitative results indicated significant improvements in pain, pain disability, depression, mental health, vitality, and self-efficacy. Interviews demonstrated improvement in RA symptoms and functioning but uncertainty about whether the intervention affected pain.

**Conclusion.** These preliminary findings indicate that IY is a feasible complementary approach for young people with RA, although larger clinical

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### Key Words

Yoga, arthritis, young adults, pain

## Introduction

Rheumatoid arthritis (RA) is a chronic disabling disease that can greatly compromise the health-related quality of life (HRQOL) and daily functioning of sufferers. Common symptoms of the disease include pain, swelling, stiffness, and loss of joint function. Disability is high within this population, and 60% are unable to work within a decade of initial diagnosis. Furthermore, people with RA evidence diminished functioning and shortened life expectancy. Although RA is more typically diagnosed in adult populations, many young people are affected. Using an estimated annual prevalence of 1.3% for those younger than 25 years derived from the National Health Interview Survey, close to 400,000 children, adolescents, and young adults suffer from arthritis in the United States.<sup>1</sup> The economic burden of the condition is high across adult and pediatric populations.<sup>2</sup> The cost to individual quality of life is also substantial. HRQOL is particularly affected when arthritis develops in childhood and adolescence, with pain, compromised physical functioning, depression, and social isolation commonly occurring.<sup>3,4</sup>

The goals of treatment include preventing disability and preserving well-being in addition to reducing pain, inflammation, and joint damage.<sup>5</sup> Established treatment approaches often involve lifestyle modifications (diet, exercise, and stress reduction), medication, surgery, and physical therapy. Major biological advances have been made in recent years, and aggressive pharmacologic treatment has resulted in patient improvements in a range of outcomes including quality of life. However, not all patients respond effectively to treatment,<sup>6</sup> and the use of some biological agents has been associated with medical risks and socioeconomic costs.<sup>7</sup> Even when joint inflammation is medically controlled, some young

patients experience RA-related disability,<sup>8</sup> suggesting the utility of complementary rehabilitation efforts, such as yoga.

For young RA patients, there is a need for supplementary evidence-based behavioral approaches that can be used alongside conventional medical treatment in the prevention of disease progression, psychosocial impairment, and disability. Studies of yoga for older adults with arthritis have demonstrated improvements in physical functioning, pain, and strength.<sup>9–12</sup> Although it is likely that young RA patients would similarly benefit from yoga, there have been no systematic investigations of the effects of yoga in this population. There is a compelling need for this research given the compromised educational, work, and social functioning of many young patients.

This exploratory pilot study used a single-arm repeated measures design to test the feasibility of yoga as an innovative, safe, cost-effective prevention, and psychosocial risk reduction program for young RA patients. Iyengar yoga (IY) is a unique prevention and risk reduction approach in its emphasis on precise anatomical alignment, use of supportive props, specific sequences of asanas (postures), and potential to address physical and psychospiritual functioning. The rigorous and standardized training that certified IY teachers undergo, including knowledge of physiology, anatomy, and yoga philosophy, support the reliability and safety of IY.

The aims of the study were to test the feasibility of IY to manage RA-related pain and functioning and to explore initial evidence of the safety and efficacy of IY for this population to inform a future large-scale clinical trial. We used a mixed-methods approach incorporating quantitative (standardized questionnaires) and qualitative (interview) methods to capture the range and depth of participants' experiences in the program.

## Methods

### Participants

Sixteen participants were originally screened for the study. Eight participants met inclusion criteria and were enrolled in the study. The inclusion criteria included diagnosis of RA for at least six months according to the revised 1987 American College of Rheumatology (ACR) criteria, aged between 18 and 35 years, concomitant use of disease-modifying antirheumatic medications was permitted provided doses were stable for eight weeks, concomitant use of nonsteroidal anti-inflammatory drugs (NSAIDs) and low-dose corticosteroids stable for four weeks, ability to provide written informed consent, and ability to speak and understand English. Inclusion was determined during a phone screening session with a qualified assistant. All participants were told that they would be participating in a pilot study on a group-administered yoga program for young adults with RA.

During interviews conducted before the start of the IY treatment, all participants expressed limitations in range of motion in joints. Participants cited hips, knees, wrists, shoulders, and fingers as sources of worst joint pain. Four of the five study completers were regularly taking NSAIDs to relieve pain, and three of the five were taking at least two disease-modifying antirheumatic drugs. One participant was currently taking prednisone. None of the participants had any self-reported comorbid chronic conditions. The duration of RA ranged from 8- to 28 years (mean [standard deviation] (SD) = 16 [8.5] years). Although all participants received a diagnosis of RA by a rheumatologist, their medical history was not available to detail the severity of disease or total number of joints affected.

Participants were recruited using advertisements in rheumatology offices and through arthritis support group newsletters. Participants who lived greater than 25 miles from the yoga studio where classes were undertaken were offered \$10 each session attended to cover gas expenses. Full ethical approval for this study was received from the UCLA Institutional Review Board, Office for Protection of Research Subjects.

### Procedure

After screening via telephone by a researcher, eligible participants completed

a battery of questionnaires as detailed below. These questionnaires were also administered postintervention after the IY program, at which point subjects were also interviewed in person regarding their experiences in the program. Interview items asked about potential postintervention changes in physical and psychological functioning, including pain and RA symptoms. In addition, a weekly monitoring form (as described below) was administered by either telephone or email two weeks before the intervention by a trained researcher, then weekly during the intervention, and at a two-month follow-up. During the follow-up period, participants were not given specific instructions regarding yoga. When requested, they were provided with referral information regarding IY teachers in their area.

Participants were instructed to continue with their ongoing medical care for the duration of the study. Medication use and physical activity were tracked by the weekly monitoring form (as described below).

*IY Program.* IY is a traditional form of yoga taught in the lineage of B.K.S. Iyengar, who is known for his prominent texts on yoga and his innovative teaching techniques, including the use of props and therapeutic sequences. Iyengar has developed specific methods of teaching therapeutic yoga practices to people with health problems.<sup>13–15</sup> The emphasis on alignment in this practice protects the joints and is unlikely to irritate inflamed joints, and the use of props to reduce tension and stress is believed to reduce inflammation. Focus on the alignment of the posture, the breath, and nonjudgmental awareness of gripping, tension, and body sensation provides additional meditative benefits.

A full range of yoga postures was taught to the students participating in the study, including supine poses, passive backbends, standing poses, supported inversions, twists, seated postures, and forward bends. Examples of the postures are included in Table 1. The postures were taught with the necessary props to protect the joints, increase circulation, and develop extension and strength without tension or stress. The classes were sequenced over time, and as students developed skills, more challenging postures were introduced. Individual limitations were addressed as needed for

Table 1  
Examples of Yoga Poses Included in the Intervention

Action	Pose Name	Description
Supine	Supported Savasana	Corpse posture
	Supta Baddhakonasana	Reclining bound angle pose
Seated posture	Upavista Konasana	Seated angle pose
Seated twist	Bharavajasana	Torso twist
Inversion	Rope Sirsana	Rope headstand
	Salamba Sarvangasana	Chair shoulder stand
Backbend	Viparita Dandasana	Inverted staff posture on two chair
	Setubandha Sarvangasana	Full bridge posture supported by bench
Forward bend	Adhomukha Svanasana	Downward dog at the wall, ropes hands on a chair
Standing postures	Utthita Tikonasana	Triangle posture
	Tadasana Urdhva Baddha Hastasana	Mountain posture with bound hands

pain, range of motion in particular joints, and fatigue. The classes were taught by an experienced junior intermediate IY teacher; an introductory level IY teacher assisted. A senior IY teacher served as an advisor.

The IY program lasted six weeks, with two sessions of yoga per week. Each session was for 1.5 hours, resulting in a total dose of 18 hours of IY. One makeup class per week was made available for participants who could not attend the regular session.

### Measures

**Pain and Functioning.** The Pain Disability Index (PDI) was used to measure pain-related functioning.<sup>16</sup> The PDI assesses the impact of pain on ability to participate in basic life activities, including home responsibilities, recreation social activity, sexual behavior, self-care, and life support activity. Patients rate their level of disability on a rating scale of 0–10. A higher score indicates more disability. Good internal reliability ( $\alpha = 0.82$ ) and validity have been reported.<sup>16,17</sup>

The Health Assessment Questionnaire (HAQ) assesses arthritis-specific disability.<sup>18</sup> Items include questions about dressing, grooming, rising, eating, walking, hygiene, reaching, grip, and making activities. The HAQ is one of the most widely recognized measures of patient functioning, with acceptable reliability and validity.<sup>18</sup> The HAQ asks about pain in the last week from 0 (no pain) to 100 (severe pain). A higher score indicates worse functioning and pain.

The Short Form-36 (SF-36),<sup>19</sup> a generic HRQOL measure, yields an eight-scale profile of functional health and well-being. The SF-36 performs comparatively better than other

HRQOL measures in terms of reliability, validity, and respondent or administrative burden.<sup>20</sup> Vitality, physical functioning, and mental health scales were used. A higher score denotes increased quality of life.

A weekly monitoring form assessed patients' weekly pain, anxiety, depression, and energy ratings using a 0–10 numeric rating scale. For example, patients were asked to rate their average pain over the past week from 0 (no pain) to 10 (worst pain imaginable). Participants were also asked to report any adverse events during the classes, any changes in medication, home practice of yoga, and level of physical activity.

**Psychospiritual Functioning.** The Brief Symptom Inventory (BSI-18)<sup>21</sup> was used to measure mood by asking patients about their anxiety, somatization, and depressive symptoms in the past seven days on a five-point Likert scale ranging from "not at all" to "extremely." The BSI-18 has shown good internal consistency and validity.<sup>21</sup> Higher scores denote more symptoms.

The Arthritis Self-Efficacy Scale<sup>22</sup> was used to assess arthritis patients' beliefs that they can perform specific tasks or behaviors to cope with the consequences of chronic arthritis. The scale has 20 items to measure pain, function, and other symptoms. Higher scores indicate greater self-efficacy.

The Chronic Pain Acceptance Questionnaire<sup>23</sup> measures the degree to which patients are willing to accept and move on with life despite pain. This is a 20-item measure with acceptable reliability ( $\alpha = 0.78$ – $0.82$ ) and validity.<sup>23</sup> An average of the activity engagement and pain willingness subscales was computed. Higher scores denote greater acceptance.

The 15-item Mindfulness Attention Awareness Scale<sup>24</sup> measures attention to what is occurring in the present moment, with higher scores denoting more mindfulness. Internal consistency and convergent and discriminate validity are high.<sup>24</sup>

*Qualitative Methods.* Semistructured interviews were carried out at the end of the intervention. Topics included perceptions of the impact of the IY program on functioning including any changes in pain, symptoms, or mood, whether the program met participants' expectations, social effects, what was/was not helpful, and whether the intervention was a good match for RA. Only responses related to pain and RA symptoms are included.

#### *Statistical Analysis*

Because of the preliminary nature of this study, analyses were based on the data from study completers only ( $n = 5$ ). Demographic characteristics were described as means and SDs for continuous variables and frequency counts and percentages for categorical variables. For the quantitative analyses, nonparametric Wilcoxon tests of dependent samples were calculated because of the small sample size and the possibility that the data did not have a normative distribution. Significance tests were set at 0.05, although trends at 0.10 were also noted. Effect sizes (using Cohen's  $d$  comparing mean changes from baseline to postintervention) were calculated to show magnitude and direction of the effect of the yoga intervention. Values of Cohen's  $d$  of 0.20, 0.50, and 0.80 represent small, medium, and large effect sizes, respectively.<sup>25</sup> Data from the weekly monitoring form were depicted graphically to provide an overview of trends across the intervention. The sample size was not sufficiently large to perform trend analyses. To assess feasibility, the percentage of respondents completing the weekly monitoring form was calculated.

For the qualitative data, ethnographic content analysis was used because we wished to systematically integrate it with the close-ended quantitative data. This technique involves the creation of a codebook based on variables identified by the researcher as relevant to the research questions and goals. Texts are read, and codes are assigned to relevant portions

of the text and entered. The process is iterative, however, and code categories are revised, expanded, and created as research progresses. Thus, the qualitative data recorded on audiotape were transcribed and entered into Microsoft Word. After the interviews had been read in detail twice by two different researchers, main themes were identified and coded according to variables that were consistent with the quantitative data. Corresponding quotes were entered into Microsoft Excel to create tables identifying the main themes.

Quantitative and qualitative measures were used to cross-validate the qualitative and quantitative data (triangulation), clarify the data from one method with the data of another (complementarity), and broaden the depth of the data (expansion).<sup>26</sup>

## **Results**

### *Quantitative Data*

During the first week of yoga classes, three participants dropped out. These participants cited a prior non-RA related injury and scheduling conflicts as reasons for withdrawal. Of the remaining five participants, 80% were female. The age range of the remaining five participants was 24–31 years, with a mean (SD) age of 28 (2.70) years. Two participants were identified as Hispanic and three identified as Caucasian non-Hispanic. Attendance ranged from 75% to 100%, with a mean of 95%. All participants completed the weekly monitoring form each week. Participants reported virtually no yoga at home. The only reported at-home yoga practice was by one participant who practiced yoga one time for 10 minutes. Baseline physical activity scores began high at an average of 103.5 minutes per week (SD = 111.4), dropped during the first week of classes to 56.5 minutes per week (SD = 62.3), and then increased each week to reach 116.5 minutes per week (SD = 116.0) by the last week of classes. At the two-month follow-up, physical activity had dropped to 82.5 minutes per week (SD = 70.4). No adverse events were reported in the weekly monitoring forms or during the interviews. Four of the five participants attended the available makeup class.

As summarized in Table 2, participants reported significantly less pain, pain disability,



Table 2  
Pre- and Postintervention Score Differences with Effect Sizes

Measure	Pre-Yoga Mean (SD)	Post-Yoga Mean (SD)	% Difference	Wilcoxon Test	Effect size (Cohen's <i>d</i> )
Pain Disability Index	25.4 (20.59)	23.2 (19.68)	−09	−2.1 <sup>a</sup>	0.12
HAQ					
Disability	1.08 (0.57)	0.78 (0.72)	−28	−1.51	0.46
Pain	51 (31.30)	25.6 (32.19)	−50	−2.0 <sup>a</sup>	0.80
SF-36					
Physical functioning	44 (32.67)	57 (34.02)	30	−1.63	−0.39
Vitality	34 (15.97)	58 (23.08)	71	−2.03 <sup>a</sup>	−1.21
Mental health	49.6 (27.8)	72.8 (21.05)	47	−2.03 <sup>a</sup>	−0.94
BSI					
Depression	7.2 (5.89)	2.4 (3.21)	−67	−2.10 <sup>a</sup>	1.01
Anxiety	7.60 (6.66)	2.60 (2.70)	−66	−1.80 <sup>b</sup>	0.98
Self-efficacy	6.24 (1.72)	7.64 (1.52)	22	−2.0 <sup>a</sup>	−0.86
Chronic pain acceptance	33.7 (9.11)	39.4 (12.00)	17	−1.75 <sup>b</sup>	−0.54
Mindfulness	3.67 (0.85)	4.2 (0.54)	15	−1.76 <sup>b</sup>	−0.74

<sup>a</sup> $P < 0.05$ .

<sup>b</sup> $P < 0.10$ .

and depression after the IY program ( $P < 0.05$ ), as well as significantly greater vitality, mental health, positive mood, and self-efficacy scores ( $P < 0.05$ ). Trends were observed for decreased anxiety and increased mindfulness and chronic pain acceptance compared with baseline ( $P < 0.10$ ). Effect sizes were generally in the medium to large range. Thus, change scores for HAQ disability and chronic pain acceptance were medium, whereas large effect sizes were seen for HAQ pain scores, the vitality and mental health subscales of the SF-36, self-efficacy, mindfulness, and the BSI depression and anxiety subscales.

Data from the weekly monitoring form ratings of pain, anxiety, energy, and depression across baseline, throughout the intervention,

and at two-month follow-up are shown in Fig. 1. Because of the small sample size, statistical tests were not performed on the multiple time points. Rather the weekly monitoring form values presented in Fig. 1 were intended to provide a descriptive overview of functioning across the intervention. An average across the two-week baseline was created to form one baseline value. Pain scores dropped from a baseline mean of 3.80 (SD = 2.02) to 2.90 (SD = 2.46) postintervention. Baseline anxiety was 4.10 (SD = 3.78) and reduced to 2.40 (SD = 1.82). Depression scores were 4.30 (SD = 3.19) at baseline and reduced to 2.00 (SD = 1.87), and mean energy was 5.60 (SD = 1.47) at baseline and 7.20 (1.48) postintervention. At the two-month follow-up, pain

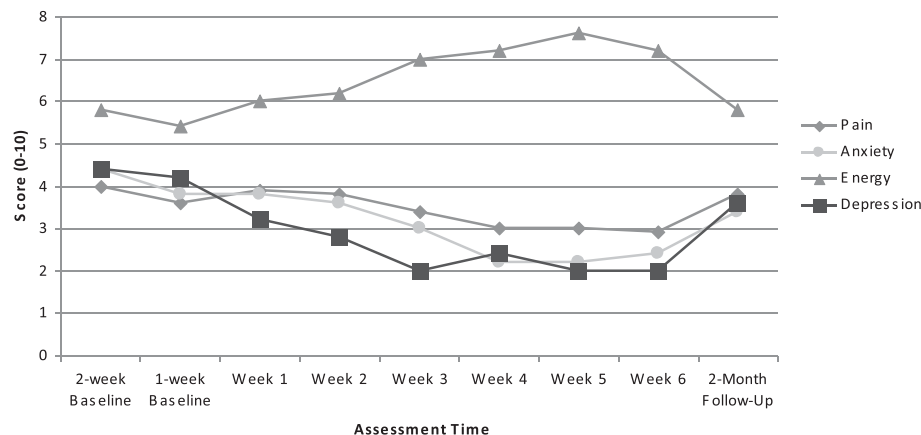


Fig. 1. Baseline, weekly, and two-month follow-up pain, anxiety, mood, and energy scores across the intervention.

had returned to baseline levels, whereas follow-up anxiety, depression, and energy appeared to trend toward baseline levels.

### *Qualitative Data*

*Pain and RA Symptoms.* There was a sense of searching for evidence, including one participant who noted that he was able to reduce his medication, and thus, “get off one of the crutches” and still manage the pain. This participant also noted an improvement in morning symptoms.

When I started, in the mornings, I would wake up with a little bit of pain in my elbow or knee or something and I really don't have that at all anymore.

Some participants mentioned an increase in muscle pain during the intervention, although it was felt that this was a “good pain” and attributed it to “waking up those areas that have not been worked out enough.” There was an uncertainty about whether the program helped with RA-related pain, with some participants ambivalent about whether their pain was improved.

And in terms of the pain, I think some days I thought “Oh wow, it's really working” and some days I don't know. It's hard to really tell.

These participants concluded that they would require a longer intervention to know whether yoga impacted pain levels. However, there was a sense of relief in affected areas, especially during class: “I felt at ease with all my joints and my body.”

Participants also expressed greater certainty about a newfound ability to deal with the pain in more adaptive and effective ways. The following quote demonstrates that rather than being a panacea for pain and symptom relief, yoga provided a tool to manage pain.

My pain is still there ...but now the difference is that I could reduce the pain by relaxing and just learning to be stress-free and just to be more peaceful. I've learned that if I'm peaceful and more stress free my pain eases away a little. So I'm doing better now.

Participants were substantially more sure about a reduction in general aches and pain.

Thus, it was felt that back pain from sitting at a computer desk or early morning stiffness was reduced. Range of motion was also improved for many, which positively impacted RA symptoms.

Participants also reported improved general functioning, although the mechanisms for this improvement may have been through psychological benefits rather than a reduction in pain.

It made me feel better ...overall it helped, just in general helped my energy level so that helped across the board with life.

No adverse events were reported, and participants felt that IY was a safe and accessible form of yoga for people with RA.

*Yoga as a Long-Term Treatment.* A number of participants expressed regret that they had only just been introduced to a form of yoga that was helpful and suitable for people with physical limitations. There was a sense that if only they had known about IY classes earlier in their diagnosis, they could have prevented much of the physical and psychological impairment they had experienced.

If I had learned this even when I was in high school, God what a great thing to learn at a young age, because sometimes pain can be worsened because we're thinking about it too much so if you are in a position to learn how to quiet that, it will help anything. If you can learn to do that when you are young, how much damage would you have in the long run?

There was a corresponding wish to share their experiences with family and friends, and to educate other young people with RA about IY: “I already tell people about yoga and this particular yoga to look for a teacher that's certified Iyengar and one that uses props.”

Despite their desire to have known about IY early on, the two-month follow-up interviews revealed that most participants had not continued with classes after the completion of the program. All participants expressed goals to continue with yoga, but only one had continued by attending local classes. The main barriers included a reluctance to attend classes



not designed for people with RA, scheduling conflicts, and a change in life circumstances.

Despite a low-level of continuation with yoga, all participants felt that the classes were valuable and beneficial. Most noted that their symptoms, particularly range of motion, were no longer improving since they had stopped yoga. Persisting in regular practice was thought to lead to increased energy, more range of motion in affected joints, improved mood, calmness, and a reduction in pain. The following participant noted that her physician had also noticed benefits after the program:

My rheumatologist even noticed the change in my fatigue and mood; he is interested in learning more about Iyengar yoga and would love to see more Iyengar yoga programs open to patients of all ages.

However, participants realized that to experience ongoing benefits, they would need to continue: "I think I need to stick with practicing yoga on a regular basis to improve symptoms long-term."

## Discussion

There was evidence for the feasibility of IY for young adults with RA. Our initial attrition rate was 37%, and it is likely that this would have been lower had we used additional exclusion criteria to screen out potential subjects with recent injuries. Scheduling difficulties were the main source of attrition, affecting 25% of our original sample. However, after the first week of classes, the remaining sample completed the study with an excellent rate of attendance. This was despite the fact that two participants traveled greater than 25 miles to attend classes, although offering gas money to those living large distances may have increased attendance. These findings suggest that given sufficient exclusion criteria and a flexible schedule to develop class times, IY is an attractive intervention for young adults with RA. There were no adverse events reported, providing initial support for the safety of IY to treat young adults with RA. Feasibility of assessing functioning across the intervention also was high, with participants completing the weekly monitoring form each week. Monitoring of symptoms

should be undertaken in future larger studies to inform the necessary dose of yoga to achieve optimal responses.

Despite the small sample size, the results of the quantitative analyses indicated that IY significantly improved the pain, pain disability, and depression of participants. Compared with baseline, significant improvements also were found for vitality, mental health, and self-efficacy. Trends were revealed for reduced anxiety and increased mindfulness and acceptance. Effect sizes were generally in the medium to large range, especially for pain and mental health variables, indicating that IY may lead to meaningful improvements in patient well-being. However, large-scale clinical trials are needed before recommendations can be made. The weekly monitoring form provided valuable descriptive information about the dose of IY. Functioning appeared to improve over time, although the follow-up data revealed a return to near-baseline levels, suggesting that either a longer IY course is required for protracted benefit or benefits are only available during active IY practice.

The findings of the present study extend the results of previous yoga research examining yoga for musculoskeletal conditions in older people. This prior work has found improved handgrip strength in RA patients<sup>9,27</sup> and improved pain and functioning after IY to treat osteoarthritis of the knee<sup>12</sup> and hands.<sup>10</sup> The present study represents the first time that a young RA population has been examined, and a spectrum of biopsychospiritual outcomes has been explored. Our qualitative findings suggest perceived benefits for RA symptoms, although reports regarding pain were mixed.

A comparison of the quantitative and qualitative data demonstrates the cross-validity of participants' responses regarding certain aspects of functioning, including enhanced well-being. One area of discrepancy in the sources of data relates to pain. Although the quantitative findings point to a significant reduction in pain, interviews revealed less certainty that yoga changed RA-related pain. It is possible that the numeric data reflected the reduced general aches and pain reported in interviews. The discrepancy may be because of limitations of questionnaire methodology, which forces respondents into pre-existing

choices, as opposed to interviews, which allow respondents to express uncertainty, and possibly allow finer grained distinction between general vs. RA-specific pain. Another explanation is that participants were less accurate in assessing their pain in the interviews, which required recall of pain over the previous six weeks, as opposed to the questionnaires that asked about pain over the last week. This is consistent with literature assessing the reliability of pain reports, which have shown recall bias, such that increasing length of report period is related to higher levels of reported symptoms.<sup>28</sup>

Comparison of the qualitative and quantitative data is valuable in terms of understanding the two-month follow-up data. The quantitative data suggested a return to near-baseline levels of functioning on the weekly monitoring form. The interviews revealed that most participants had not continued with a regular yoga practice, and simultaneously reported a reduction in the benefits they experienced during the intervention. Together, these data suggest that to experience long-term improvements, young people with RA may require a lasting yoga practice. Future research should explore barriers to continued practice, and whether yoga at home is a suitable substitute on completion of a yoga program. Given that RA is a chronic disease, long-term management of symptoms is expected. This may especially be the case for physical activity, with current RA recommendations indicating the need for regular and sustained activity.<sup>29</sup>

The significant quantitative findings and the enhanced sense of well-being revealed in the qualitative data point to the promise of IY as an adjunct treatment for young adults with RA. Larger studies are needed that include a substantial sample and use a randomized controlled design to account for the attention, group, and expectation effects of being in a yoga class. In particular, the positive effects of group membership may have led to some of the benefits, especially given that a number of participants reported that they appreciated being with similarly affected people. Our subject group was predominantly (80%) female, although this ratio is not atypical for yoga classes in the general population<sup>30</sup> or for an RA population.<sup>31</sup> Furthermore, our IY program

was only six weeks long. Ratings from the weekly monitoring form suggest that a longer intervention might have resulted in further improvements. Future studies should consider lengthening the duration of the program to maximize physical and mental health outcomes.

Further research is needed regarding the biological aspects of yoga. Self-reported functioning was chosen as the primary outcome in this study because of the recent emphasis on patient reported outcomes in clinical research over biochemical and physical measurements.<sup>18</sup> However, symptoms such as joint counts and sedimentation rates may provide additional information about the range of outcomes impacted, whereas measuring autonomic nervous system activation and neuroendocrine responses would allow validation of participant's reports regarding a sense of well-being and relaxation.

Although conclusions are limited by the small sample size and inability to control for nonspecific effects such as group support, the present study contributes to our understanding of yoga as a suitable adjunct treatment in the clinical care of young RA patients. The findings suggest that IY is attractive to patients. Further studies are required to confirm that yoga impacts well-being, including physical and psychospiritual functioning. It is likely that long-term yoga practice is required to maintain benefits. Given the proliferation of yoga studios and the possibility of home practice, incorporating yoga as part of a management program may be feasible. However, the very abundance of yoga classes raises an additional point regarding safety. Not all yoga classes are comparable in terms of safety and efficacy, and caution must be exercised in recommending yoga classes that do not have a demonstrable teacher training system or experience with medical populations. The present study examined IY, a tradition associated with an extensive training program and therapeutic sequences and modifications specifically for patients. It is questionable whether the findings generalize to other styles of yoga. Should further research confirm the present findings, IY is likely to offer a cost-effective, transportable, and accessible tool for young RA patients.

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