

# Research

## Perceived Activities and Participation Outcomes of a Yoga Intervention for Individuals with Parkinson's Disease: A Mixed Methods Study

Brent L. Hawkins, PhD, LRT/CTRS,<sup>1</sup> Marieke Van Puymbroeck, PhD, CTRS,<sup>1</sup> Alysha Walter, MS, CTRS,<sup>1</sup> Julia Sharp, PhD,<sup>2</sup> Kathleen Woshkolup, MD,<sup>3</sup> Enrique Urrea-Mendoza, MD,<sup>4</sup> Fredy Revilla, MD,<sup>4</sup> Arlene A. Schmid, PhD, OTR<sup>2</sup>

1. Clemson University, Clemson, S.C.

2. Colorado State University, Ft. Collins, Colo.

3. St. Francis Hospital, Greenville, S.C.

4. Greenville Health System, Greenville, S.C.

Correspondence: [blhawki@clemson.edu](mailto:blhawki@clemson.edu)

### Abstract

Parkinson's disease (PD) often leads to poor balance, increased falls, and fear of falling, all of which can reduce participation in life activities. Yoga, which usually includes physical exercise, can improve functioning and life participation; however, limited research has been conducted on the effects of yoga on life participation of individuals with PD. This study had two purposes: (1) to identify and understand the perceived activities and participation outcomes associated a therapeutic yoga intervention for individuals with PD; and (2) to compare the perceived activities and participation outcomes with the outcomes measured in the clinical trial. A single-blind, randomized, waitlist-controlled, phase II exploratory pilot study using an after-trial embedded mixed methods design (clinical trial Pro00041068) evaluated the effect of an 8-week Hatha Yoga intervention on individuals with PD. Directed content analysis was used to analyze focus group interviews with participants who completed the yoga intervention. Quantitative and qualitative data were merged and compared using a data comparison matrix. Qualitative analysis indicated many activities and participation outcomes. Comparison of qualitative and quantitative data indicated the yoga intervention led to improved balance, mobility, and functional gait, and fewer falls. These outcomes reached beyond the intervention and into participants' daily lives. Results support the use of Hatha Yoga as a community-based rehabilitation intervention for individuals with PD. Yoga, as part of an interdisciplinary approach to treatment, can improve many types of activities and participation outcomes (e.g., mobility, social relationships, self-care, handling

stress, recreation). *Hawkins, Van Puymbroeck, Walter, et al. Int J Yoga Therapy 2018(28). doi: 10.17761/2018-00018R2.*

**Keywords:** Parkinson's disease, yoga, ICF activities and participation, mobility, mixed methods, quality of life

### Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder that can cause motor, cognitive, and psychological impairment, such as tremors, stiffness, slow and uncoordinated gait, freezing gait, reduced memory, reduced problem-solving ability, and anxiety.<sup>1</sup> These impairments can lead to increased falls and fear of falling, poor balance, decreased strength, and reduced quality of life.<sup>2</sup> Despite the negative effects of PD, symptoms can be treated and early treatment can improve prognosis.<sup>1</sup>

Physical activity has been shown to improve functioning in people with PD, likely due to improving neuroplasticity.<sup>3</sup> In fact, exercise is being prescribed for the treatment and rehabilitation of PD due to the therapeutic benefits it has yielded.<sup>4</sup> Novel types of exercise are necessary to prevent the functional declines associated with PD and promote sustained participation in exercise. Yoga includes a novel type of exercise that has been shown to improve motor function and other areas of life participation in many populations.<sup>5-14</sup> Specifically, a systematic analysis of mind-body interventions reported that yoga has demonstrated a large effect on improvement of motor PD symptoms.<sup>15</sup> However, little is known about how motor improvement affects life participation among individuals with PD and how yoga can be used as a rehabilitation modality for PD.

To date, four intervention studies on the outcomes of yoga as a therapeutic intervention for PD have been published. One study reported improved balance and mobility using a single-subject research design. Quality of life was also measured, but no change was observed.<sup>16</sup> Three randomized controlled trials have been conducted using yoga interventions for PD. One reported statistically significant improvements in overall motor function, balance, joint range of motion, and gait initiation after a 12-week Hatha Yoga intervention.<sup>17</sup> Another study reported improvements, albeit not statistically significant, in lower extremity strength and function, flexibility, motor control, and depression after an 8-week Hatha Yoga intervention.<sup>5</sup> Finally, statistically significant improvements in bradykinesia, rigidity, muscle strength, mobility, activities of daily living, and quality of life were observed in a Power Yoga intervention.<sup>18</sup>

The International Classification of Functioning, Disability, and Health (ICF) is a conceptual framework appropriate for classifying areas of functioning associated with yoga. The ICF is a holistic way to examine an individual's functioning and life participation and the contextual factors that impact these areas.<sup>19</sup> The ICF classifies functioning and disability into two domains: Body Function and Structure, and Activities and Participation. Body Function refers to the physiological functions of the body, and Body Structure is the anatomical parts of the body.<sup>20</sup> Activities and Participation refers to a task or action and a person's ability to execute that task or action in a life situation and includes the domains Learning and Applying Knowledge; General Tasks and Demands; Communication; Mobility; Self Care; Domestic Life; Interpersonal Interactions and Relationships; Major Life Areas; and Community, Social, and Civic Life. Contextual factors are the physical, social, and attitudinal environment in which the person lives. The present study focused on understanding outcomes related to Activities and Participation.

The ICF is used in research to classify and understand functioning and participation of people with disabilities.<sup>21,22</sup> The ICF's Activities and Participation domains have been used previously as an a priori coding scheme to conceptualize and understand participation and role function among military service members.<sup>23</sup> Another qualitative study on a Hatha Yoga intervention for individuals recovering from stroke used the ICF framework to identify and understand the perceived outcomes associated with the ICF's Activities and Participation.<sup>12</sup> Activities and Participation outcomes included increases in activity overall; increase in ability to perform specific tasks or actions, such as walking, stair navigation, showering, taking out the trash, and lawn mowing; improved social participation and developing friendships within the study group; and increased confidence in com-

munity participation. Although other studies have discovered Activities and Participation outcomes, it is unknown if these types of outcomes are also experienced by individuals with PD as a result of yoga participation, and the extent to which the outcomes are experienced. The current research intended to understand the perceived outcomes associated with a yoga intervention using the ICF's Activities and Participation among individuals with PD.

Yoga, used as a therapeutic intervention, can be provided with the intent of influencing Activities and Participation-related outcomes often targeted in rehabilitation. For example, yoga interventions can be designed to improve ambulation (i.e., Mobility),<sup>16,18</sup> to manage stress (i.e., General Tasks and Demands),<sup>24</sup> to promote health (i.e., Self Care),<sup>24</sup> and to improve recreation activity (i.e., Community, Social, and Civic Life).<sup>25</sup> Therefore, Activity and Participation outcomes are likely influenced as a result of yoga.

This mixed methods study had two purposes: (1) to identify and understand the perceived Activity and Participation outcomes associated with a therapeutic yoga intervention for individuals with PD; and (2) to compare the perceived Activities and Participation outcomes with the outcomes measured in the clinical trial. This study was a subset of a larger clinical trial testing the effects of a yoga intervention on gait, mobility, balance, fall rates, and fear of falling for individuals with PD.

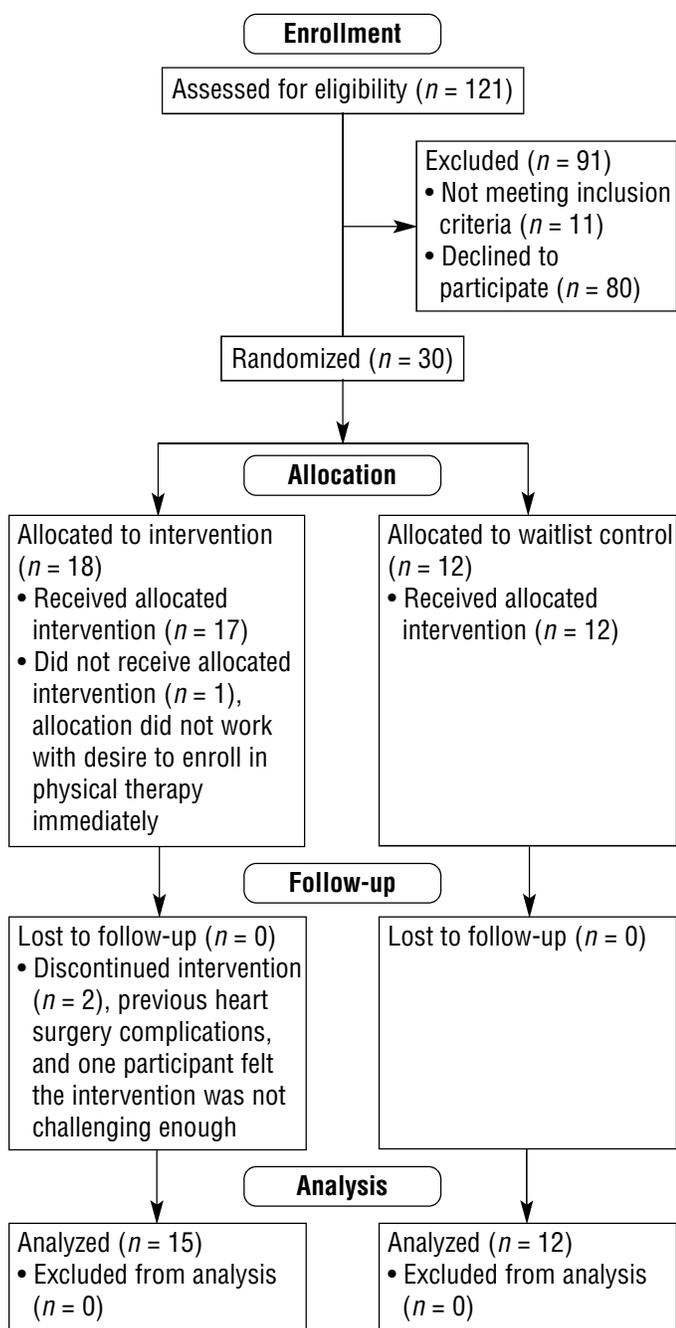
## Methods

An after-trial embedded mixed methods design was used to examine the efficacy of therapeutic yoga as a rehabilitation strategy for individuals with PD.<sup>26</sup> The qualitative phase of the study was conducted after the therapeutic yoga intervention was implemented with the experimental and wait-list-control participants. Figure 1 depicts the design of the randomized controlled trial (clinical trial Pro00041068), which was approved by the appropriate research review boards prior to starting.

The purpose of the qualitative methods was to assist in the overall interpretation of the more heavily weighted quantitative trial that measured outcomes associated with balance and fear of falling. Quantitative results are in review elsewhere.<sup>27</sup> The qualitative data served as a post hoc analysis to understand participant perceptions of the relationships between the yoga intervention and their ability to participate in life activities. The ICF's Activities and Participation domains were identified as an a priori data analysis framework to achieve the research purposes.

## Participants

Participants included adults diagnosed with PD (rating of

**Figure 1.** Randomized Controlled Trial Design

1.5–4 on the Modified Hoehn and Yahr Scale of Parkinson's Disease Progression)<sup>28</sup> who reported a fear of falling, were able to stand and walk 10 meters, scored at least 4 out of 6 on the Short Mini Mental State Exam,<sup>29</sup> and were willing and able to participate in the yoga intervention two times per week for 8 weeks. Exclusion criteria consisted of: self-reported life expectancy of less than 12 months; inability to attend yoga sessions because of transportation issues; currently receiving physical therapy; enrolled in another intervention study; or did not provide informed consent due to inability or refusal. Additional recruitment and informed

consent procedures for the clinical trial are reported elsewhere.<sup>27</sup> Participants for the qualitative phase of the study included participants with PD who completed the yoga intervention and were willing to participate in a focus group.

### Intervention

The intervention was an 8-week, progressively difficult, therapeutic yoga intervention developed by a yoga therapist and recreational therapist who have previous experience and training with yoga and yoga research. The yoga therapist was the instructor for the yoga sessions. The intervention was developed to improve balance and reduce fear of falling. Sessions occurred twice a week for 1 hour and were consistent with other balance, yoga, and lower extremity programming.<sup>6,14,30</sup> Yoga exercises were delivered in a standardized progression that included *asanas* (postures), *pranayama* (breathing), and *dhyana* (meditation). Modified yoga postures were performed sitting, standing, and in supine positions. Slow and focused breathing was practiced throughout each session. Meditation was practiced at the beginning of each session and facilitated by the yoga therapist, who read positive and empowering passages aloud to the group. Participants were also explicitly instructed to think about their body positioning in space and link movements to breath. To link movement to breath, the yoga therapist taught participants to move during the inhalation and maintain or increase the stretch during the exhalation. Postures were held for multiple slow breaths. Once the intervention progressed to the floor exercises, the relaxation was completed lying supine with an eye pillow. Floor exercises were adapted using a chair if the participant was not able to transfer to the floor or if the floor was uncomfortable. All yoga sessions ended with approximately 10 minutes of relaxation using progressive relaxation techniques. The relaxation component (i.e., *savasana*) was based on ideas of resting the physical body and “integrating” the practice. Spouses or significant others were also allowed to participate in the yoga sessions.

### Data Collection

Qualitative data were collected through small focus groups conducted using a semi-structured interview protocol to maintain consistent questioning between interviewers. The question categories included the general effects of the yoga intervention, transference of effects, psychosocial impacts, and programmatic aspects. Some of the questions reflected Activities and Participation-related concepts (e.g., How has the program impacted you in your home?). Questions within these categories were designed to understand the participants' perceived outcomes and experiences with the yoga intervention. See Table 1 for the list of primary questions.

**Table 1.** Focus Group Questions

| Category                | Primary Questions  |
|-------------------------|--|
| General effects         | Tell me about your expectations of this program.<br>Tell me how this program has impacted you.<br>What benefits did you receive from the program?<br>Were there any things that changed that were not positive?<br>Please describe   |
| Transference of effects | How has the program impacted you in your home? In your community?<br>Will you continue with yoga after the study? Why or why not?<br>In what ways will you continue?   |
| Psychosocial impacts    | What is it like to be in yoga with other people with Parkinson's disease?<br>Have you developed new friendships or felt support from members in this group?<br>Please describe.<br>Do you feel the program impacted your overall quality of life?<br>Has the program changed your perception of yourself or your Parkinson's condition?  |
| Programmatic aspects    | Do you think this type of yoga is appropriate for people with Parkinson's? Why or why not?<br>What parts of the program/sequences/poses did you benefit from most? Why?<br>What parts of the program/sequences/poses did you dislike or not benefit from? Why?<br>What changes would you suggest to the program?<br>When you missed a session, what prevented you from coming? |

The researchers (two recreational therapists with doctor of philosophy degrees, one recreational therapy doctoral student) skilled in designing and implementing qualitative methodologies, including the design of the current study, conducted the interviews. The expertise of these researchers in qualitative methods contributes to the credibility and dependability of data collection and analysis.<sup>31,32</sup> Prior to interviews, the researchers assisted with overseeing the yoga

sessions and had established a rapport with participants. Researchers were aware of some participants' progression throughout the intervention through observation of sessions and other interaction with participants associated with the organization of the intervention and study. Having an established relationship likely assisted participants with feeling comfortable with sharing their experiences during focus groups, further contributing to the trusting relationship between researchers and participants, and therefore, the authenticity of data yielded.<sup>31</sup>

During the focus groups, the researchers implemented various techniques to maximize responses and comfort with sharing. At the beginning of the focus groups, all participants were strongly encouraged to provide open, honest responses to prevent social desirability bias. Other techniques included formal encouragement of all participants to talk about their experiences, asking quieter participants to share about their perspectives, redirecting participants who were perseverative, asking probing questions for clarity, and using restatements to ensure accuracy of understanding of questions and answers.

### Data Analysis

Focus groups were audio recorded and transcribed into electronic text, yielding four transcripts. Directed content analysis (DCA) was used to analyze the transcripts. DCA is a deductive analytic technique that assists researchers with applying a theory or framework to a phenomenon under study.<sup>33</sup> Because the purpose of this study was to understand the outcomes and experiences of participants using the ICF as a guiding framework, DCA was used to develop and categorize codes into the Activities and Participation domains of the ICF. The first stage of DCA included coding the data using predetermined categories to understand the nature of the interview content within the context of the ICF. The domains within Activities and Participation (e.g., Mobility, Self Care, Domestic Life) were used as the categorical structure.<sup>33</sup> The second level of coding was based on the domains within Activities and Participation to pinpoint specific affected areas. As this study's purpose was to understand the Activities and Participation outcomes, statements that reflected other ICF domains (e.g., Body Function and Structure, Environmental and Personal Factors) are not reported. Frequency of codes within each category provided indication of the ranked order of categories for comparison of outcomes.<sup>33,34</sup>

A second researcher reviewed the coding schema to ensure the accuracy of the codes assigned to the Activities and Participation domains. Any conflicting perspective on a code was discussed until agreement was reached on the appropriate fit for the code to a domain. This process aided in the trustworthiness of the data.<sup>32</sup>

### Data Mixing Process

After qualitative data were analyzed, the data were compared to the quantitative results from the clinical trial as a way to mix the data and elicit a more comprehensive interpretation.<sup>35</sup> Measures used in the quantitative phase of the clinical trial included the Movement Disorders Society–Sponsored Revision of the Unified Parkinson's Disease Rating Scale (Part III) to measure PD-specific motor function,<sup>28</sup> Mini BESTest to measure motor-related balance,<sup>36</sup> Functional Gait Assessment to measure gait and fall risk,<sup>37</sup> Freezing of Gait Questionnaire to measure freezing of gait,<sup>38</sup> and the Montreal Cognitive Assessment (MoCA) to assess cognitive function.<sup>39</sup>

Mixing of functional data (quantitative) and Activities and Participation data (qualitative) allows for the demonstration of the interrelationships between these two domains of health. A data comparison matrix was developed to visually compare results between the datasets to highlight complementary and conflicting findings. This technique is common in mixed methods designs to further understand both the measured and perceived outcomes of an intervention.<sup>26</sup>

### Results

Four focus groups were conducted with participants who completed the yoga intervention ( $n = 7$ ,  $n = 5$ ,  $n = 5$ ,  $n = 2$ ). Small focus group sizes promoted a group dynamic that allowed all to share their experiences, especially participants with some cognitive impairment as evidenced by MoCA scores.<sup>39</sup> The sample mean on the MoCA was 23.86 (range 8–29), indicating that some participants demonstrated little cognitive impairment, whereas others met the criteria for mild cognitive impairment (26/30) as well as PD with dementia ( $< 21/30$ ).<sup>40</sup> Two individuals demonstrated significantly lower scores on the MoCA (8 and 14) and were therefore interviewed together to provide individual assistance with interviews as needed (e.g., shorter, less abstract questions; increased time to respond; rephrased more difficult questions).

Participants had a mean age of 63 years (range 56–81 years); seventeen were married, one was widowed, and one was divorced; all were white; all were retired or did not work; all but one person lived with others; and all except one person had a college education.

The DCA resulted in 106 codes that correspond to the Activities and Participation domains of the ICF. These codes represented items within the domains of Mobility; Interpersonal Interactions and Relationships; Self Care; General Tasks and Demands; Community, Social, and Civic Life; and Domestic Life. Table 2 reports the ranked order of domains based on number of codes. Number of

**Table 2.** Coding Structure\*

| Activities and Participation Domain                    | Number of Qualitative Codes |
|--|-----------------------------|
| <b>d4 Mobility</b>                                     | <b>46</b>                   |
| d415 Maintaining a body position                       | 17                          |
| d410 Changing basic body position                      | 10                          |
| d450 Walking   | 9                           |
| d455 Moving around                                     | 5                           |
| d498 Mobility, other specified                         | 5                           |
| <b>d7 Interpersonal Interactions and Relationships</b> | <b>27</b>                   |
| d7200 Forming relationships                            | 18                          |
| d7701 Spousal relationships                            | 5                           |
| d730 Relating with strangers                           | 2                           |
| d760 Family relationships                              | 2                           |
| <b>d5 Self Care</b>                                    | <b>18</b>                   |
| d570 Looking after one's health                        | 14                          |
| d540 Dressing  | 2                           |
| d510 Washing oneself                                   | 1                           |
| d550 Eating  | 1                           |
| <b>d2 General Tasks and Demands</b>                    | <b>6</b>                    |
| d240 Handling stress and other psychological demands   | 4                           |
| d299 General tasks and demands, unspecified            | 2                           |
| <b>d9 Community, Social, and Civic Life</b>            | <b>4</b>                    |
| d920 Recreation and leisure                            | 4                           |
| <b>d6 Domestic Life</b>                                | <b>3</b>                    |
| d630–d649 Household tasks                              | 3                           |
| <b>Total Codes</b>                                     | <b>104</b>                  |

\*Numbers preceding the categories are the corresponding codes from the International Classification of Functioning, Disability, and Health (ICF).

codes indicates the number of incidences in which the Activities and Participation outcome was mentioned in the focus group narratives.

Selected representative quotes that support the Activities and Participation domains can be found in Table 3. References for the representative quotes are included in the descriptions of the domains.

### Mobility

Change in mobility was the most commonly discussed outcome reported by participants. Prevailing statements in their narratives were related to improved confidence in reducing harm when a fall occurs, improved balance, and being more aware of mobility limitations.

Given that all participants endorsed a fear of falling to

**Table 3.** Representative Quotes for Activities and Participation Domains

|   |  |
|---|--|
| <b>Mobility</b>                                     | <p>Q1: “I’ve developed the skills to know how to get myself back up. In fact, I fell the other day . . . my husband asked me, ‘Where did you fall?’ And I said, ‘I fell on the pine straw on the back yard.’ And he said, ‘Did you hurt yourself?’ and I said, ‘No, I didn’t.’ In fact, nothing hurt.” (d410 Changing basic body position)</p> <p>Q2: “So for me to get down and out of the floor had been sort of painful. This has taught me that I can do it, and that you can get up.” (d410 Changing basic body position)</p> <p>Q3: “It’s definitely improved my balance quite a bit. I have not fallen once since I started class and I have been on some challenging things . . . so that’s definitely helped.” (d415 Maintaining a body position)</p> <p>Q4: “I found any exercises that we did that required balance, like on one foot, I found them oftentimes to be difficult, but also very beneficial.” (d410 Changing basic body position)</p> <p>Q5: “A couple of times I’ve tripped over curbs, so I’ve fallen a couple of times. But this has given me an awareness, so I just think about things a little bit different . . . [Yoga] just has increased my awareness, it put me more in touch with my own limitations.” (d498 Mobility, other specified)</p> <p>Q6: “And I can actually, from a sitting position, I can stand up one time. One attempt. My family will admit to this, that that was one of my first symptoms was it took me sometimes four or five times to get up out of a chair.” (d410 Changing basic body position)</p> |
| <b>Interpersonal Interactions and Relationships</b> | <p>Q7: “It’s kind of interesting that when people with Parkinson’s get together, we actually are subjected to a wealth of knowledge that oftentimes doctors aren’t truly up to speed on.” (d7200 Forming relationships)</p> <p>Q8: “Well, because we’re all kind of equal, and we’re here for the same reason.” (d7200 Forming relationships)</p> <p>Q9: “One [benefit] was bringing my wife. My wife started doing the yoga . . . it’s benefited her probably three times as much as it’s benefited me.” (d7701 Spousal relationships)</p> <p>Q10: “. . . the confidence to be in more group social interactions. My husband is a regional sales director . . . and he does a lot of wine tasting events . . . and I was initially a little bit skittish about going with him . . . it’s given me the confidence to engage in more [crosstalk] social activities.” (d7701 Spousal relationships)</p> <p>Q11: “Before I didn’t want to tell anybody I had Parkinson’s, and now it’s like . . . you know what? It doesn’t bother me.” (d730 Relating with strangers)</p>  |
| <b>Self-Care</b>                                    | <p>Q12: “I had tons of problems before . . . as I got so heavy . . . but that’s—this program gave me the strength to go ahead—it’s alright to drink water, or look at the nutrition.” (d570 Looking after one’s health)</p> <p>Q13: “I want to continue to do [yoga] correctly . . . so I get the benefits.” (d570 Looking after one’s health)</p> <p>Q14: “I know I can tie my shoes now with breathing and not killing myself.” (d540 Dressing)</p> <p>Q15: “If I’m in the shower, and I close my eyes, and I pick my head up, I’m not so much worried about falling anymore.” (d510 Washing oneself)</p>  |
| <b>General Tasks and Demands</b>                    | <p>Q16: “I think the other thing that [yoga] did for me was relaxing . . . rather than tightening your muscles.” (d240 Handling stress and other psychological demands)</p> <p>Q17: “The best part for me was the stress reliever.” (d240 Handling stress and other psychological demands)</p> <p>Q18: “I get to thinking, just take a deep, slow breath, if I’m anxious about something.” (d240 Handling stress and other psychological demands)</p> <p>Q19: “And [yoga] builds up your stamina too.” (d299 General tasks and demands, unspecified)</p> <p>Q20: “I don’t think it helps in my stamina, and that’s one thing that’s been disappointing is that I’ll go home and I’ll have to take a nap for a couple of hours . . .” (d299 General tasks and demands, unspecified)</p>   |
| <b>Community, Social, and Civic Life</b>            | <p>Q21: “I’m a photography enthusiast, and the breathing exercises have really helped me . . . It just makes me enjoy my hobby a whole lot more . . . because now I can calm myself down, and kind of eliminate, not totally eliminate, but lessen the shakes.” (d920 Recreation and leisure)</p> <p>Q22: “It helps me when I shoot too. I don’t shake or have tremors. I control my breath, get the trigger where it belongs between the tip of my finger and the first knuckle. And shoot.” (d920 Recreation and leisure)</p>  |
| <b>Domestic Life</b>                                | <p>Q23: “I’ve never done yoga. I would never have done yoga . . . Basically, I haven’t done much since I’ve been over 50. So it’s really been good to get back into doing something.” (d920 Recreation and leisure)</p>  |

be included in the study, their confidence with falling more safely was important to them. They perceived improvements in their ability to fall safely during the yoga intervention. Some individuals described falling in their home or community since the study's start, but they described being able to safely fall and stand back up independently or semi-independently. Participants related increased falling skills to the yoga activities that required them to move from standing, to the floor, and back to standing, with assistance as needed (questions 1 and 2). Improved balance was a commonly reported mobility outcome and was associated with reduced falls for some (Q3). In addition, participants provided details as to which yoga postures were associated with improved balance (Q4). The challenge of yoga practices assisted participants in becoming more aware of their limitations and realizing their current physical abilities (Q5). Overall strengthening and daily mobility, such as standing from a seated position, were also improved through yoga (Q6).

### **Interpersonal Interactions and Relationships**

Developing a PD-related support system was an important outcome for participants. They found strength and companionship in one another because of their shared experiences with PD that took shape through the yoga intervention. Although not a direct program component included in the yoga protocol, their interactions before, during, and after sessions were beneficial to learn about PD and share knowledge (Q7 and Q8).

Yoga also affected relationships with spouses and in other social situations. Some social outcomes were reported due to the design of the intervention where a spouse or significant other was allowed to participate concurrently. Other participants described improved social functioning because of the confidence to be in social situations with their spouse again. Participants reflected on yoga's ability to provide the couple with a new activity to strengthen their relationship (Q9 and Q10). Interacting with strangers also became easier as their confidence with PD and their abilities increased. Some individuals no longer felt ashamed by their PD symptoms (Q11).

### **Self Care**

In regard to self-care, taking care of one's health was the most common response. Participants made statements suggesting they were more aware of their health choices and wanted to continue to use yoga as a way to promote their health (Q12 and Q13). Other self-care tasks were associated with other activities of daily living, such as reduced effort to dress their lower body without holding onto a support and improved ability to shower (Q14 and Q15).

### **General Tasks and Demands**

Many participants viewed yoga as a means to reduce stress and other psychological demands as well as increase stamina to handle general tasks (Q16–Q19). However, one participant noted no changes in stamina to handle general tasks and demands after yoga (Q20).

### **Community, Social, and Civic Life**

All codes within the Community, Social, and Civic Life domain were related to improved participation in recreation and leisure. Through yoga, individuals learned how to reduce their hand tremors through breathing, which enabled them to more easily engage in their chosen activity (Q21 and Q22). Other participants noted that yoga provided them with another recreation outlet for exercise that they did not initially think they would enjoy (Q23).

### **Domestic Life**

A few participants noted improvements in ability to complete tasks in their household, including picking up dirty socks from the floor, speeding up tasks (e.g., computer use, painting, working on the car), and going into the attic (d630–d649 Household tasks).

### **Data Mixing**

When results from the qualitative data presented in this article and quantitative data from the trial<sup>27</sup> were compared, complementary and conflicting results were found. Both datasets demonstrated improvements in balance, functional gait, motor functioning, and fear of falling. Conflicting results were found for freezing of gait. The quantitative data measured various aspects of mobility, whereas the qualitative results expanded the scope of outcomes beyond mobility. Table 4 is a comparative matrix that summarizes and interprets the merged results.

### **Discussion**

The purpose of this study was to understand the perceived ICF-based Activities and Participation outcomes associated with a therapeutic yoga intervention for individuals with PD, as well as to compare the perceived qualitative outcomes to the quantitative outcomes measured in the clinical trial.<sup>27</sup> Analyses of the qualitative focus group data revealed perceived outcomes associated with Activities and Participation domains of Mobility; Interpersonal Interactions and Relationships; Self Care; General Tasks and Demands; Community, Social, and Civic Life; and Domestic Life. These domains are listed in order of relative importance as judged by the number of codes found in the present analysis. Participant descriptions of their experiences

**Table 4.** Mixed Methods Comparative Matrix

| <b>Quantitative Results*<br/>(Clinical Trial Pre–Posttest Analysis)</b>  | <b>Qualitative Results<br/>(Comparable Quotes)</b>   | <b>Interpretation</b>  |
|--|--|--|
| Statistically significant improvement in balance (Mini BESTest)<br>$t(14) = -6.01, p < 0.0001$<br>Mean pretest 19.47 (SD 9.70)<br>Mean posttest 24.87 (SD 7.79)  | <i>“It’s definitely improved my balance quite a bit.”</i> (Mobility; d415 Maintaining a body position)<br><br><i>“I found any exercises that we did that required balance, like on one foot, I found them oftentimes to be difficult, but also very beneficial.”</i> (d410 Changing basic body position)   | <b>Complementary results:</b> Significant improvement in balance scores, and participants reported balance improvements.   |
| Statistically significant improvement in functional gait and reduction of fall risk (Functional Gait Assessment)<br>$t(14) = -6.67, p < 0.0001$<br>Mean pretest 14.93 (SD 8.07)<br>Mean posttest 20.93 (SD 8.04)   | Functional gait quote: <i>“I walk faster than my wife now.”</i> (Mobility; d450 Walking)<br><br>Reduced fall risk quote: <i>“I have not fallen once since I started class, and I have been on some challenging things . . . so that’s definitely helped.”</i> (Mobility; d415 Maintaining a body position) | <b>Complementary results:</b> Improvement in functional gait and reduced risk of falling was measured and reported as an outcome by participants.  |
| Statistically significant improvement in motor function (Movement Disorders Society–Sponsored Revision of the Unified Parkinson’s Disease Rating Scale)<br>$t(14) = 2.97, p = 0.0102$<br>Mean pretest 28.27 (SD 14.89)<br>Mean posttest 21.87 (SD 15.16) | <i>“And I can actually, from a sitting position, I can stand up one time. One attempt. My family will admit to this, that that was one of my first symptoms was it took me sometimes four or five times to get up out of a chair.”</i> (Mobility; d410 Changing basic body position)                       | <b>Complementary results:</b> Motor function scores improved significantly, and participants described their application of motor improvements in the context of their daily lives.  |
| Statistically significant improvement in freezing of gait (Freezing of Gait Questionnaire)<br>$t(14) = 2.68, p = 0.0179$<br>Mean pretest 7.60 (SD 6.30)<br>Mean posttest 5.00 (SD 5.44)  | Change in freezing of gait was not reported by participants. All but one participant reported freezing of gait at pretest.   | <b>Conflicting results:</b> All but one participant reported freezing of gait. Significant improvements in freezing of gait were measured. However, freezing of gait was not reported as an outcome by participants during focus groups. |

\*Quantitative results reported elsewhere.<sup>27</sup>

SD = standard deviation.

during the yoga intervention indicated that the outcomes reached beyond the intervention and into their daily lives at home, in their communities, and in their social support systems. Participants described changes in participation in a range of activities, including improved home and community mobility, forming new supportive relationships and friendships with other people with PD, increasing social activities with their families, taking care of their health, easier dressing and other domestic tasks, improved stress relief, and improving recreation and leisure participation. Participants attributed these changes to the yoga intervention. More specifically, improvements in Activities and Participation can be attributed to the functional improve-

ments discovered in the quantitative data (e.g., balance, motor function, gait) resulting from the yoga intervention.

Complementary and conflicting results were discovered when the qualitative data were compared to the quantitative data from the clinical trial.<sup>27</sup> Both forms of data supported that the yoga intervention was successful at yielding beneficial balance, mobility, functional gait, overall motor function, and falls outcomes. The complementary findings support the statistical and clinical significance of the outcomes experienced by participants. The changes in motor function are also in agreement with a previous study reporting motor improvements associated with yoga among individuals with PD.<sup>15</sup>

However, the data conflicted in regard to freezing of gait. Participants did not perceive any change in freezing of gait during the study, despite statistically significant improvements in the freezing of gait score. Although not reported as a primary qualitative data result, some participants reported little to no difficulty with freezing of gait during focus groups and therefore did not report experiencing any change. Conflicting findings on this outcome do not invalidate the effects of the yoga intervention on freezing of gait, but rather present the effects of the intervention in two different lights.

Findings support and expand the knowledge of outcomes reported in previous yoga for PD studies. Similar to other studies, the present study found improvements related to balance,<sup>16,17</sup> mobility,<sup>16</sup> and motor control.<sup>5</sup> However, the previous studies did not analyze Activities and Participation-related outcomes. This study supports that individuals with PD reported a range of Activities and Participation improvements beyond motor function outcomes. When compared to a qualitative study following a yoga intervention with individuals recovering from stroke,<sup>12</sup> similar Activities and Participation outcomes were reported in the present study (e.g., improved ability to perform home tasks, social participation, community participation). This study adds further evidence of yoga's ability as a rehabilitation modality to improve function not only within the bounds of the rehabilitation clinic, but to also influence functioning in home and community environments. Transference of functioning is an important aspect of rehabilitation, and yoga has potential to facilitate that transfer.

### Implications

Overall, this study further supports the use of Hatha Yoga as an intervention for community-based rehabilitation of individuals with PD. The quantitative and qualitative data reported in these analyses and the larger clinical trial, in addition to past research, support the functional and participation-based outcomes of therapeutic yoga as a rehabilitative modality. It is important to note that yoga may be an interdisciplinary modality used in rehabilitation given education of staff, interdisciplinary planning, and openness to new types of treatment.<sup>41</sup> Also, patients who have participated in yoga in inpatient rehabilitation have reported beneficial outcomes of integrating yoga into rehabilitation and recommend the increased use of yoga as part of treatment.<sup>42</sup> The yoga intervention in the current study was developed through close collaboration between a recreational therapist, a yoga therapist who was also a physical therapist assistant, a physical therapist, an occupational therapist, and a team of neurologists. This combination of professionals is

common in many rehabilitation settings, so a similar yoga intervention could likely be implemented to help individuals with PD improve functioning and participation in many life contexts.

### Limitations

This study is limited by the heterogeneity of the qualitative and quantitative data that were merged and compared. The qualitative responses did not exactly match the domains measured in the quantitative outcome measures, although the narratives in the focus groups were quite similar. In addition, not all participants who completed the yoga intervention were able to participate in the focus groups. Therefore, the experiences of these yoga participants were not captured in the qualitative data. Finally, this study contained a homogeneous sample of individuals with PD, albeit one relatively representative of the PD population in the United States.<sup>43</sup>

### Recommendations for Future Research

Future research should consider quantitatively measuring the six ICF Activities and Participation domains highlighted in this study in therapeutic yoga studies. The qualitative data resulted in many other types of outcomes that were not measured in the quantitative trial phase of the study (e.g., Interpersonal Interactions and Relationships; Self Care; General Tasks and Demands; Community, Social, and Civic Life; Domestic Life). These findings indicate that yoga may affect outcomes in many areas of Activities and Participation beyond mobility and motor function. Because yoga is considered a holistic rehabilitation modality, it is important to measure impact on functional outcomes in daily life to more comprehensively capture the scope of the outcome potential of yoga.

### Acknowledgments

This work was funded by a Clemson University College of Health, Education, and Human Development Interdisciplinary Research Innovation Grant. The authors also wish to acknowledge Kevin Kopera, MD, Leslie Wise, DPT, Nikki Stafford, MBA, OTR, and Stephanie Tanner, MS, for their assistance in the study within the Greenville Health System. In addition, the authors are grateful to yoga therapist Peggy Ambler, ICYT, who led the yoga intervention, and to our student helpers: Spensir Mowrey, Jaesung Park, and Katie Mitchell.

### Conflict-of-Interest Statement

The authors have no conflicts of interest to disclose.

## References

1. Hinson, V. K., Bergmann, K. J., Revuelta, G. J., & Vaughan, C. L. (2014). A primer on Parkinson's disease. In *Movement Disorders Program of the Medical University of South Carolina*. Retrieved from [http://www.muschealth.org/neurosciences/services/movement-disorders/forms/APrimer on Parkinsons Disease\\_03\\_07\\_14.pdf](http://www.muschealth.org/neurosciences/services/movement-disorders/forms/APrimer%20on%20Parkinsons%20Disease_03_07_14.pdf)
2. Adkin, A., Frank, J., & Jog, M. (2003). Fear of falling and postural control in Parkinson's disease. *Movement Disorders*, 18(5), 496–502.
3. Petzinger, G. M., Fisher, B. E., Van Leeuwen, J., Vukovic, M., Akopian, G., Meshul, C. K., . . . Jakowec, M. W. (2010). Enhancing neuroplasticity in the basal ganglia: The role of exercise in Parkinson's disease. *Movement Disorders*, 25(Suppl. 1), S141–S145. <https://doi.org/doi:10.1002/mds.22782>
4. Nieuwboer, A. (2009). Exercise for Parkinson's disease: The evidence under scrutiny. Presented at Exploring Proposals for Research Collaboration Relating to Exercise and Parkinson's Disease. A Conference for Researchers Organized by the Special Research Interest Group (SPRING) of the PDS. Developing the Disease-Modifying Possibilities of Exercise on Parkinson's, Sept. 24–25, 2009, Gatwick, U.K.
5. Boulgarides, L. K., Barakatt, E., & Coleman-Salgado, B. (2014). Measuring the effect of an eight-week adaptive yoga program on the physical and psychological status of individuals with Parkinson's disease. A pilot study. *International Journal of Yoga Therapy*, 24(24), 31–41.
6. DiBenedetto, M., Innes, K. E., Taylor, A. G., Rodeheaver, P. F., Boxer, J. A., Wright, H. J., & Kerrigan, D. C. (2005). Effect of a gentle Iyengar yoga program on gait in the elderly: An exploratory study. *Archives of Physical Medicine and Rehabilitation*, 86(9), 1830–1837. <https://doi.org/10.1016/j.apmr.2005.03.011>
7. Groessl, E. J., Weingart, K. R., Johnson, N., & Baxi, S. (2012). The benefits of yoga for women veterans with chronic low back pain. *Journal of Alternative and Complementary Medicine*, 18(9), 832–838. <https://doi.org/10.1089/acm.2010.0657>
8. Hawkins, B. L., Stegall, J. B., Weber, M. F., & Ryan, J. B. (2012). The influence of a yoga exercise program for young adults with intellectual disabilities. *International Journal of Yoga*, 5(2), 151–156. <https://doi.org/10.4103/0973-6131.98244>
9. Moriello, G., Denio, C., Abraham, M., DeFrancesco, D., & Townsley, J. (2013). Incorporating yoga into an intense physical therapy program in someone with Parkinson's disease: A case report. *Journal of Bodywork and Movement Therapies*, 17(4), 408–417. <https://doi.org/10.1016/j.jbmt.2013.01.005>
10. Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative and Complementary Medicine*, 16(1), 3–12. <https://doi.org/10.1089/acm.2009.0044>
11. Staples, J., Hamilton, M., & Uddo, M. (2013). A yoga program for the symptoms of post-traumatic stress disorder in veterans. *Military Medicine*, 178(8), 854–860.
12. Van Puymbroeck, M., Allsop, J., Miller, K. K., & Schmid, A. (2014). ICF-based improvements in body structures and function, and activity and participation in chronic stroke following a yoga-based intervention. *American Journal of Recreation Therapy*, 13(3), 23–33. <https://doi.org/10.5055/ajrt.2014.0076>
13. Van Puymbroeck, M., Schmid, A., Shinew, K. J., & Hsieh, P. C. (2011). Influence of hatha yoga on physical activity constraints, physical fitness, and body image of breast cancer survivors: A pilot study. *International Journal of Yoga Therapy*, 21(21), 49–60.
14. Zettergren, K. K., Lubeski, J. M., & Viverito, J. M. (2011). Effects of a yoga program on postural control, mobility, and gait speed in community-living older adults. *Journal of Geriatric Physical Therapy*, 34(2), 88–94. <https://doi.org/10.1519/JPT.0b013e31820aab53>
15. Kwok, J. Y., Choi, K. C., & Chan, H. Y. (2016). Effects of mind-body exercises on the physiological and psychosocial well-being of individuals with Parkinson's disease: A systematic review and meta-analysis. *Complementary Therapies in Medicine*, 29, 121–131. <https://doi.org/10.1016/j.ctim.2016.09.016>
16. Hall, E., Verheyden, G., & Ashburn, A. (2011). Effect of a yoga programme on an individual with Parkinson's disease: A single-subject design. *Disability and Rehabilitation*, 33(15–16), 1483–1489. <https://doi.org/10.3109/09638288.2010.529233>
17. Colgrove, Y., Sharma, N., Kluding, P., Potter, D., Imming, K., VandeHoef, J., . . . White, K. (2012). Effect of yoga on motor function in people with Parkinson's disease: A randomized, controlled pilot study. *Journal of Yoga & Physical Therapy*, 2(2), 1–11.
18. Ni, M., Mooney, K., & Signorile, J. F. (2016). Controlled pilot study of the effects of power yoga in Parkinson's disease. *Complementary Therapies in Medicine*, 25, 126–131. <https://doi.org/10.1016/j.ctim.2016.01.007>
19. World Health Organization. (2002). *Towards a common language for functioning, disability, and health*. Geneva: WHO.
20. World Health Organization. (2001). *International Classification of Functioning, Disability, and Health*. Geneva: WHO.
21. Cerniauskaite, M., Quintas, R., Boldt, C., Ragge, A., Cieza, A., Bickenback, J. E., & Leonardi, M. (2011). Systematic literature review on ICF from 2001 to 2009: Its use, implementation and operationalisation. *Disability & Rehabilitation*, 33(4), 281–309. <https://doi.org/10.3109/09638288.2010.529235>
22. Rimmer, J. H. (2006). Use of the ICF in identifying factors that impact participation in physical activity/rehabilitation among people with disabilities. *Disability & Rehabilitation*, 28(17), 1087–1095. <https://doi.org/10.1080/09638280500493860>
23. Resnik, L. J., & Allen, S. M. (2007). Using International Classification of Functioning, Disability and Health to understand challenges in community reintegration of injured veterans. *Journal of Rehabilitation Research & Development*, 44(7), 991–1005.
24. Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, 57, 35–43. [https://doi.org/10.1016/S0022-3999\(03\)00573-7](https://doi.org/10.1016/S0022-3999(03)00573-7)
25. Van Puymbroeck, M., Smith, R., & Schmid, A. (2011). Yoga as a means to negotiate physical activity constraints in middle-aged and older adults. *International Journal on Disability and Human Development*, 10(2), 117–121. <https://doi.org/10.1515/IJDHD.2011.029>
26. Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research*. Thousand Oaks, California: Sage Publications Inc.
27. Van Puymbroeck, M., Walter, A., Hawkins, B., Sharp, J., Woschkolup, K., Urrea-Mendoza, E., . . . Schmid, A. (2017). Functional improvements following an 8-week yoga intervention for individuals with Parkinson's Disease: A pilot study. *Manuscript submitted for publication*.
28. Goetz, C. G., Tilley, B. C., Shaftman, S. R., Stebbins, G. T., Fahn, S., Martinez-Martin, P., . . . Zweig, R. M. (2008). Movement Disorder Society-Sponsored Revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS): Scale presentation and clinimetric testing results. *Movement Disorders*, 23(15), 2129–2170. <https://doi.org/10.1002/mds.22340>
29. Callahan, C. M. (2002). Six-item screener to identify cognitive impairment among potential subjects for clinical research. *Medical Care*, 40(9), 771–781. <https://doi.org/10.1097/01.MLR.0000024610.33213.C8>
30. Lubetzky-Vilnai, A., & Kartini, D. (2010). The effect of balance training on balance performance in individuals poststroke: A systematic review. *Journal of Neurologic Physical Therapy*, 34(3), 127–137. <https://doi.org/10.1097/NPT.0b013e3181ef764d>
31. Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Thousand Oaks, Calif.: SAGE Publications, Inc.
32. Long, T., & Johnson, M. (2000). Rigour, reliability and validity in qualitative research. *Clinical Effectiveness in Nursing*, 4(1), 30–37.
33. Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>
34. Guttman, L. (1944). A basis for scaling qualitative data. *American Sociological Review*, 9(2), 139–150.
35. Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). *Best practices for mixed methods research in the health sciences*. Washington, D.C.: National Institutes of Health. <https://obssr.od.nih.gov/training/mixed-methods-research/>

36. Franchignoni, F., Horak, F., Godi, M., Nardone, A., & Giordano, A. (2010). Using psychometric techniques to improve the Balance Evaluation Systems Test: The mini-BESTest. *Journal of Rehabilitation Medicine, 42*(4), 323–331. <https://doi.org/10.2340/16501977-0537>
37. Wrisley, D., Marchetti, G., Kuharsky, D., & Whitney, S. (2004). Reliability, internal consistency, and validity of data obtained with the Functional Gait Assessment. *Physical Therapy, 84*(10), 906–918.
38. Giladi, N., Shabtai, H., Simon, E. S., Biran, S., Tal, J., & Korczyn, A. D. (2000). Construction of freezing of gait questionnaire for patients with Parkinsonism. *Parkinsonism and Related Disorders, 6*(3), 165–170. [https://doi.org/10.1016/S1353-8020\(99\)00062-0](https://doi.org/10.1016/S1353-8020(99)00062-0)
39. Smith, T., Gildeh, N., & Holmes, C. (2007). The Montreal Cognitive Assessment: Validity and utility in a memory clinic setting. *The Canadian Journal of Psychiatry, 52*(5), 329–332.
40. Nasreddine, Z., Phillips, N., Bedirian, V., Charbonneau, S., Whitehead, V., Collin, I., . . . Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society, 53*(4), 695–699.
41. Van Puymbroeck, M., Miller, K. K., Dickes, L. A., & Schmid, A. A. (2015). Perceptions of yoga therapy embedded in two inpatient rehabilitation hospitals: Agency perspectives. *Evidence-Based Complementary and Alternative Medicine, 2015*. <https://doi.org/10.1155/2015/125969>
42. Schmid, A. A., DeBaun-Sprague, E., Gilles, A. M., Maguire, J. M., Mueller, A. L., Miller, K. K., . . . Schalk, N. (2015). Yoga influences recovery during inpatient rehabilitation: A pilot study. *International Journal of Yoga Therapy, 25*(1), 141–152. <https://doi.org/10.17761/1531-2054-25.1.141>
43. Wright Willis, A., Evanoff, B. A., Lian, M., Criswell, S. R., & Racette, B. A. (2010). Geographic and ethnic variation in Parkinson disease: A population-based study of US Medicare beneficiaries. *Neuroepidemiology, 34*(3), 143–151. <https://doi.org/10.1159/000275491>