

## Yoga for Functional Fitness in Adults with Intellectual and Developmental Disabilities

### Abstract

**Background:** Yoga is an effective intervention to improve functional fitness in adults with and without disabilities, but little research exists regarding yoga's impact on functional fitness for individuals with intellectual and developmental disabilities (IDDs). **Aims:** The purpose of this study was to examine the benefits of a group yoga intervention on the functional fitness of adults with IDDs. **Methods and Materials:** This yoga intervention included 12 sessions of yoga over 7 weeks (60-min sessions twice a week) at a special population recreation and leisure program. The functional fitness test was used to examine physical functioning before and after the yoga intervention. **Results and Conclusions:** Eight adults completed the baseline and posttest measures (age mean = 31; standard deviation = 6.55; 50% male). There were significant improvements in lower-body strength ( $9.00 \pm 4.63$  vs.  $11.50 \pm 3.16$ ,  $P = 0.04$ , 28% improvement), upper-body strength ( $11.25 \pm 3.54$  vs.  $14.25 \pm 3.37$ ,  $P = 0.018$ , 27% improvement), and agility and balance ( $9.29 \pm 4.1$  vs.  $6.60 \pm 1.54$ ,  $P = 0.036$ , 29% improvement). Functional fitness often declines for people with IDD at a faster rate than the general population; thus, these significant changes indicate that a yoga intervention may enhance functional fitness for people with IDD. Clinicians or other healthcare providers might consider yoga as a means to improve functional fitness in adults with IDDs.

**Keywords:** Functional fitness, intellectual and developmental disabilities, recreational therapy, yoga for disabilities

### Introduction

Collectively, individuals diagnosed with a health condition classified as an intellectual or developmental disability are referred to as individuals with intellectual and developmental disabilities (IDDs). IDD encompasses multiple diagnoses including, but not limited to, autism spectrum disorder, Down syndrome, and fragile X syndrome.<sup>[1]</sup> Individuals with IDDs have impaired intellectual developmental functioning such as reduced cognitive, social, and practical skills, impaired physical functioning, learning, language, and behavior.<sup>[2]</sup> IDDs are congenital or occur during an individual's developmental stages and are generally diagnosed before the age of 18 years.<sup>[2]</sup>

Adults with IDDs exhibit signs and symptoms of premature aging at an accelerated rate compared to the general population.<sup>[3]</sup> In particular, adults with IDDs are prone to physical decline in

sensorimotor skills, coordination, muscular strength, flexibility, and balance in part due to physical inactivity.<sup>[4]</sup> Due to these physical limitations, adults with IDDs may be limited in activities required for vocation, recreation, and independent living, otherwise known as functional fitness.<sup>[4]</sup> Functional fitness is the capacity to safely and independently execute daily physical activities, such as walking longer distances without falling or lifting household items without undue lethargy.<sup>[5,6]</sup> Although functional fitness training and testing were developed to focus on strength, flexibility, endurance, and balance in older adults, these same issues are important for adults with IDD.<sup>[6,7]</sup>

To improve functional fitness in individuals with IDDs, it is suggested that physical activity should be adapted to and focused on age-appropriate activities that incorporate balance, flexibility, and strength training.<sup>[3,7]</sup> These activities should be social and incorporate low- to moderate-intensity

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### Access this article online

Website: [www.ijoy.org.in](http://www.ijoy.org.in)

DOI: 10.4103/ijoy.IJOY\_57\_19

### Quick Response Code:



**How to cite this article:** Reina AM, Adams EV, Allison CK, Mueller KE, Crowe BM, Puymbroeck Mv, et al. Yoga for functional fitness in adults with intellectual and developmental disabilities. *Int J Yoga* 2020;13:156-9.

**Submitted:** 01-Aug-2019 **Revised:** 24-Jan-2020.

**Accepted:** 12-Mar-2020 **Published:** 01-May-2020.

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exercises that target the major muscle groups for approximately 2½ h/week.<sup>[3]</sup> Hatha yoga is a physical activity that improves functional fitness in adults with brain injuries after 6 week.<sup>[8]</sup> To the best of our knowledge, no published studies have evaluated the impact of yoga on functional fitness in adults with IDDs. The purpose of this study was to examine the impact of a 7-week yoga intervention on the functional fitness of adults with IDDs.

## Methods

### Study design

This was a single-arm study with pre- and post-intervention assessments. The intervention included 12 1-h sessions of group yoga, twice a week for 7 weeks.

### Participants

Participants were recruited through county's special population recreation and leisure program. Legally authorized representatives (LARs) of all potentially eligible individuals were given informational consent packets which contained a description of the study, a media release form, an informed consent form, and a demographic form. If the LAR consented to the study, assent was obtained from individuals with IDD who chose to participate in the study. To participate in the study, individuals must have met the following criteria: diagnosed IDD; LAR consent; participant assent; 18 years or older; a current participant in the special population recreation and leisure program; and answer "no" to all questions on the Physical Activity Readiness Questionnaire<sup>[9]</sup> or receive permission from their physician.

### Measures

The LAR reported participant's demographic data, including age, sex, race, education level, and participation in other exercise. Physical performance measures, using the functional fitness test (FFT), were completed at the special population recreation and leisure program by trained research assistants.

### Functional fitness test

Functional fitness was assessed with the FFT,<sup>[10]</sup> which includes six functional tasks considered to be required for independent living. The FFT was developed for use with older adults and has not been used in its entirety in IDD populations. However, individual assessments in the FFT have been used with good reliability in the study samples with IDD.<sup>[4,7]</sup> The FFT was used as there are a limited number of assessments of physical function considered to be reliable and valid in adults with ID.

### Intervention (Yoga program)

The intervention protocol was developed, standardized, and taught by a team of certified yoga teachers and a yoga therapist. The yoga intervention targeted muscular

strength and balance [Table 1 for poses]. Participants were given the option of hands-on assistance, modifications, and alternatives to yoga postures from trained staff members as needed. Props such as chairs, wall space, straps, and bolsters were used for posture modification. All sessions ended with a supine relaxation pose.

### Data analysis

Data analysis was conducted using IBM's SPSS version 25 (IBM Corporation in Armonk, NY, USA). Demographic data were analyzed using descriptive statistics, including means, standard deviation, frequencies, and proportions. Normality was assessed with the Shapiro-Wilk test; data were nonnormally distributed; thus, nonparametric statistics (Wilcoxon signed-rank test) were used to evaluate change between pre- and post-yoga assessment scores. Pre- and post-yoga assessment scores were further examined with a percent change calculation ( $\text{Time}_1 - \text{Time}_2 / \text{Time}_1 \times 100$ ).

## Results

Twelve participants assented although four participants did not complete postyoga assessments and were eliminated from the sample. Data from the eight participants who completed pre- and post-yoga assessments were used for analysis [Table 2]. Significant improvements were observed in lower-body strength via the chair stand test (28%;  $P = 0.04$ ), upper-body strength via the arm curl test (27%;  $P = 0.018$ ), and agility and balance via the timed up-and-go test (29%;  $P = 0.36$ ). Nonsignificant improvements occurred in the lower-body flexibility via chair sit-and-reach test (47.31%;  $P = 0.73$ ), upper-body flexibility via back-scratch test (53%;  $P = 0.49$ ), and endurance via 2-min step test (21.32%;  $P = 0.09$ ) [Table 3].

## Discussion

Results from this 7-week yoga intervention showed significant improvements in functional fitness related to lower-body strength, upper-body strength, and agility and dynamic balance. Similar findings show that upper- and lower-body strength improved in a healthy adult sample after 8 weeks of Hatha yoga practice due to improved isokinetic strength, likely as a result of holding postures for an extended period of time in combination with controlled transitions from one pose to the next.<sup>[11]</sup> Similar to the findings investigating yoga with adults with disabilities,<sup>[12]</sup> agility and dynamic balance was significantly improved in the current sample, which is particularly important in this population due to increased risk of falls at younger ages.<sup>[13]</sup> Given the significant improvements in the current sample, it is plausible that yoga may improve strength and agility and dynamic balance for adults with IDD, although additional research is necessary.

Although flexibility and endurance did not significantly improve postyoga intervention in the current sample,

**Table 1: Standardized yoga sequence**

Position	Yoga posture name (if applicable)	Sanskrit Name	Anatomical purpose
Seated	Yogic breathing	Pranayama	Slow, deep, rhythmic breathing
	Locust arms and cactus arms	Salabhasana	Spinal extension
	Boat pose, puppy pose	Uttana Shishosana	Hip and spinal flexion
	Fold forward, staff pose	Dandasana	Hip and spinal flexion
	Boat pose	Navasana	Abdominal and hip strengthening
	Cat pose, cow pose	Marjariasana /Bitilasana	Spinal flexion and extension
	Child's pose	Balasana	Hip rotation
Standing	Chair pose, awkward chair	Utkatasana	Knees flexed; shoulders extended
	Mountain pose	Tadasana	Anatomical position
	Mountain pose with cactus arms	Tadasana (variation)	Hip extension while standing
	Warrior I and Warrior II pose	Virabhdhrasana A and B	Prolonged lunges
	Tree pose	Vrikshasana	Balance on one leg
	Forward fold	Uttanasana	Hamstring flexibility
	Lunge	Anjaneyasana	Supine extension, leg stretches, and core strengthening
	Goddess pose to five-pointed star	Utkata Konasana	Hip rotation
	Reversed warrior pose	Viparita Virabhdhrasana	Arm flexion with hip extension through lunges
	Downward dog pose	Adho Mukha Svanasana	Hip flexion, should extension and strengthening
Floor postures (prone, seated, supine)	Bridge pose	Setu Bandha Sarvangasana	Leg and glute strengthening
	Tabletop	Bharmanasana	Arm extensions
	Reclining hand to big toe pose	Supta Padangusthasana	Stretching hamstrings and hip flexion
	Caterpillar and cobra	Bhujangasana	Spinal extension
	Staff pose	Dandasana	Seated hip flexion
	Supine gentle twist	Supta Matsyendrasana	Spinal rotation
	Supine cobblers pose	Supta Baddha Konasana	Hip rotation and stretching
	Corpse pose with meditation	Savasana	Supine relaxation

**Table 2: Demographics for the 11 participants who completed pre-yoga testing**

M ±SD	Frequency (%)
Age, mean±SD	31±6.55
Sex, frequency (%)	
Male	4 (50)
Female	4 (50)
Race	
White	6 (75)
Black	2 (25)
Marital status	
Single	8 (100)
Education	
Grades 7-12	1 (12.5)
High school graduate	4 (50)
Special education certificate	2 (25)
Not specified	1 (12.5)
Involved in other exercises?	
Yes	7 (87.5)
No	1 (12.5)

SD=Standard deviation

lower-body flexibility still improved by 47%. The lack of significant results is contrary to the findings in other studies in various diagnostic populations<sup>[8,14]</sup> and surprising given the percent change in lower-body flexibility. Meanwhile,

the evidence for yoga and endurance is conflicted with some sources, suggesting that endurance is not better than brisk walking.<sup>[15]</sup> Some of the participants in the current study were also involved in other forms of exercises which may have improved their endurance, potentially skewing results. The lack of significant improvement in flexibility could be explained by participants having previous experience with yoga or participation in other physical activities. Although participants were asked if they participated in other physical activities, the frequency and types of activity were not obtained potentially confounding results. Further investigation is needed to clarify the effects of yoga on flexibility while controlling for other physical activity types in adults with IDD.

### Limitations

The results of this study should be taken within the context of certain limitations, such as a small sample size, no control group, and in only one location. In addition, the sample was recruited from a small group currently involved in the special population recreation and leisure program, with previous yoga experience and ongoing extracurricular participation in physical activities. It is unclear if a practice effect had any impact on improved scores, or if lack of tester blinding could have impacted scores. Due to the small sample size, formal IDD diagnosis, comorbid illnesses,

**Table 3: Participants pre- and post-yoga intervention functional fitness test scores**

Functional fitness variable	FFT item	Mean±SD		P	Percent change
		Pre	Post		
Lower-body strength	30-s chair stand	9.00±4.63	11.50±3.16	0.040*	↑27.78
Upper-body strength	Arm curl	11.25±3.54	14.25±0.37	0.018*	↑26.67
Lower-body flexibility	Chair sit-and-reach	-1.86±6.34	-0.98±7.44	0.735	↑47.31
Upper-body flexibility	Back-scratch	-7.54±5.92	-7.56±6.73	0.499	↑.53
Endurance	2-min step	44.00±15.98	53.38±22.18	0.092	↑21.32
Agility and dynamic balance	Up-and-go	9.29±4.1	6.60±1.54	0.036*	↓28.96

\* $P > 0.05$ . FFT=Functional fitness test, SD=Standard deviation. ↑=denotes an increase in change from baseline to posttest, ↓=denotes a decrease in change from baseline to posttest

and adaptive functioning were not able to be accounted for statistically. Finally, the planned dose was impacted by special population recreation and leisure program scheduling limitations, such as operational hours and holidays.

Future studies may include multiple comparison groups to assess the differences between control, physical activity, and yoga conditions. The IDD condition varies greatly along with diagnosis of comorbidities. Therefore, comparisons for the effects of yoga between various IDD diagnoses, adaptive functioning, and comorbid illness are warranted. Finally, valid and reliable assessments for this population are needed to improve future studies.

Despite the limitations, this study provides preliminary results that yoga may be an effective approach to increasing functional fitness in adults with IDD. Given that the needs of adults with IDD are often overlooked, the results may inform further investigations into the clinical and social significance of addressing functional fitness with yoga in the population.

## Conclusion

This study contributes novel information as it was the first known study to examine the benefits of yoga on the functional fitness of adults with IDDs. It is recommended that validity, reliability, and norms be established for the FFT with this population, which would make the FFT more useful in the future yoga intervention studies. These preliminary results indicate that yoga may be a valuable intervention to improve physical strength, flexibility, endurance, and agility and balance for people with IDD, a population often overlooked in yoga research.

## Acknowledgments

We are grateful to the participants in our program who enthusiastically engaged in yoga and to the staff who facilitated the involvement of their participants.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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