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## Evaluation of Rewind Yoga on Physical Function Outcomes in Older Adults: A Preliminary Study

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### ABSTRACT

Yoga is growing in popularity and has the potential to improve strength, flexibility, mobility, and balance in older adults. However, few yoga programs tailored to the unique needs of older adults exist. Rewind Yoga™ was created to address this gap and a pilot study was conducted to evaluate the effectiveness of the program on physical function parameters. Healthy, older adults ( $n = 16$ ) residing in a retirement community (55 and older) enrolled in a study examining the effect of Rewind Yoga™ on strength, flexibility, dynamic balance, and endurance as measured by the Senior Fitness Test. A single group design ( $n = 14$ ) with three repeated measures (baseline, 6 weeks, and 12 weeks) was used. Results from repeated measures analysis of variance indicated significant ( $P < 0.05$ ) improvements in all measures of the Senior Fitness Test at 6 and 12 weeks. Rewind Yoga™ appears to improve flexibility, strength, dynamic balance, and muscular endurance in older adults.

### ARTICLE HISTORY

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### KEYWORDS

Balance; elderly; falls; older adult; physical function; senior; senior fitness test; yoga

## Introduction

The older adult population in the United States is rapidly growing. In 2012, 13.7% of the population was over the age of 65 and this number is expected to increase to 20% by 2030 (U.S. Department of Health and Human Services, 2013). Physical activity (PA) has been shown to reduce the risk of developing numerous diseases including heart disease, cancer, hypertension, and diabetes (U.S. Department of Health and Human Services, 2008). Despite these known benefits, only 15.9% of older adults reported meeting current PA guidelines (Centers for Disease Control and Prevention (CDC), 2013), suggesting a strong need to increase PA participation in this population. Fear of injury, poor balance, weak muscle strength, limited physical function, and a lack of appropriate PA programs for older adults may contribute to decreased PA participation among older adults (Lim & Taylor, 2005; Moschny, Platen, Klaaßen-Mielke, Trampisch, & Hinrichs, 2011; Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2007). Therefore, developing and evaluating PA

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programs that address the unique needs and concerns of older adults is necessary to promote PA participation and potentially improve health outcomes in this population.

Falls are a major health concern for older adults. More than one third of all adults over the age of 65 experience a fall each year and this risk increases with age (Hausdorff, Rios, & Edelberg, 2001; Inouye, Brown, & Tinetti, 2009; Verma et al., 2016). Consequences of falls can vary from simple bruising to bone fracture or even death (Sterling, O'Connor, & Bonadies, 2001). In 2006, the total cost for falls was estimated to be between 0.85% and 1.5% of all healthcare expenditures (Heinrich, Rapp, Rissmann, Becker, & König, 2010). In 2010 the total lifetime cost of annual, unintentional fall-related injuries resulting in hospitalization or emergency room treatment was 111 billion dollars (Verma et al., 2016). By 2020, the cost of falls is expected to reach 32 billion dollars annually (Stevens, Corso, Finkelstein, & Miller, 2006). Exercise or PA is currently one of two strategies recommended by the United States Preventive Task Force for preventing falls (Moyer, 2012) yet the specific type or dose of exercise necessary to prevent a fall has not been clearly elucidated. Yoga may be an effective form of exercise for improving balance in older adults but balance as an outcome measure is underutilized in yoga studies (Jeter, Nkodo, Moonaz, & Dagnelie, 2014).

The low impact nature and scalability in difficulty makes yoga an ideal form of exercise for older adults (Krucoff, Carson, Peterson, Shipp, & Krucoff, 2010). However, few yoga programs designed specifically for older adults that are scalable and adaptable to the capabilities of older adults exist. Moreover, the development of effective yoga programs for older adults that could be broadly disseminated in community settings may have a substantial impact on the health of older adults. Previous yoga studies with older adults have shown improvements in cardiovascular health (Damodaran, Malathi, Patil, Shah, & Marathe, 2002), flexibility, endurance (Brown, Koziol, & Lotz, 2008), strength (Chen et al., 2008) and balance (Schmid, Van Puymbroeck, & Koceja, 2010; Van Puymbroeck, Payne, & Hsieh, 2007).

To address the gap in yoga programs for older adults, YMEDICA developed Rewind Yoga™ specifically for older adults between the ages of 55–70. It was designed to be scalable to the participant's level of familiarity with yoga as well as his or her current health and strength status. The program was designed with the ultimate goal of becoming a broadly disseminated yoga program for older adults. Rewind yoga™ was critically reviewed by experts with specialties in yoga and instructor development throughout the development process. The development of the program was also reviewed by osteopath clinicians and experts in healthy aging research. A pilot study of the effects of the effects of Rewind Yoga™ was planned as part of the development process prior to promoting and introducing the program on a broader scale. Therefore, the purpose of this

study was to test the effects of a 12-week Rewind Yoga™ program on measures of balance, strength, and endurance in older adults.

## **Methods**

### ***Design***

A quasi-experimental, single-group design with three repeated outcome measures (baseline, 6, and 12 weeks) was used to evaluate program effectiveness. All participants completed an informed consent developed by YMEDICA prior to beginning the Rewind Yoga™ program. The Institutional Review Board at Arizona State University approved the secondary data analysis of the data.

### ***Setting and participants***

Participants at a local retirement community were invited to attend free yoga classes at the community's clubhouse. Participants were screened at the discretion of an osteopathic physician to be sure they were healthy enough to participate in the Rewind Yoga™ program. A convenience sample of 16 female participants (Age =  $68 \pm 5$  years, Height =  $164.9 \pm 7$  cm, Weight =  $70.0 \pm 12$  kg, BMI =  $26 \pm 4$ ), enrolled in the yoga program. Fifteen individuals finished the program (94% retention); however, only 14 participants had measurements for all time points and were used in the statistical analysis. One participant dropped out due to time conflicts with the yoga classes. Eight of the participants engaged in regular, light intensity PA such as walking, water aerobics, and playing golf outside of the program at baseline. Their baseline PA continued throughout the 12-week program. Seven participants reported no regular physical activity.

### ***Intervention***

Participants attended yoga sessions three times per week for 12 weeks at a local senior community center. Each session was 60 minutes total, including warm-up and cool-down periods. The Rewind Yoga™ program was delivered by a certified yoga instructor with experience working with older adults. All sessions began with a warm-up followed by Rewind Yoga™ and a cool-down period. A typical session consisted of 10–15 yoga poses that targeted the major muscle groups of the legs, trunk, and arms (e.g., gastrocnemius, hip flexors, hip extensors, abdominals, trapezius, serratus anterior, latissimus doris, biceps, and triceps). The poses were designed to improve range of motion and balance and to ease back pain. The poses in Rewind Yoga™ could be performed either on the floor or with the assistance of a chair allowing for progression of difficulty and intensity. Participants were monitored by the

yoga instructor throughout the program to determine when and if progression was necessary.

### **Outcome measures**

The Senior Fitness Test battery (SFT) (Rikli & Jones, 1999a) was used to evaluate lower and upper extremity strength, flexibility, dynamic balance, and aerobic endurance at baseline, 6 weeks (midway point) and 12 weeks. Lower and upper body strength were measured with the 30-second chair stand and 30-second arm curls, respectively. Lower and upper body flexibility were measured with the chair sit-and-reach and back scratch test, respectively. Aerobic endurance was measured with the 2-min step test and motor agility/dynamic balance was measured with the 8-ft up-and-go. The SFT has been rigorously evaluated. It is highly reliable (Intraclass reliability  $R = 0.80\text{--}0.98$ ) and has strong criterion validity ( $r = 0.73\text{--}0.83$ ) (Rikli & Jones, 1999a). The 8-ft up-and-go from the SFT has been shown to be a predictor of falls in older adults (Rose, Jones, & Lucchese, 2002). This battery of tests also provides extensive normative data which can be used for comparison purposes to help interpret findings (Rikli & Jones, 1999b). To determine what percentile of fitness each individual in the yoga group corresponded with, we compared the SFT scores of each participant at every time point with the published normative data. This allowed us to see if the yoga group's SFT scores improved over time with respect to where they fell on the normative percentile table.

### **Statistical analysis**

IBM statistical analysis package SPSS versions 22 was used to analyze data. Shapiro-Wilk's, skewness and kurtosis were analyzed to check for normality of the data. Data at all time points were determined to be normally distributed based on the Shapiro-Wilk's test ( $p > 0.05$ ) or a skewness and kurtosis between  $-2$  and  $2$ . An ANOVA with repeated measures was used to examine changes in group mean scores over time. In order to accommodate potential error for assumed sphericity, a Greenhouse-Geisser correction was used. Post-hoc analysis using a Bonferroni correction was used to compare across each time point (baseline, 6 weeks, and 12 weeks). A Pearson correlation was used to examine if there was a relationship between attendance and baseline PA with the change in SFT scores from baseline to 12 weeks. A McNemar test with paired samples was used to analyze the difference in the number of participants below and above the 50th percentile of their age normative scores at baseline compared to 12 weeks.

**Table 1.** Mean and SD for each measure of the SFT ( $n = 14$ )

	F Value	Baseline (Mean $\pm$ SD)	6 Weeks (Mean $\pm$ SD)	12 Weeks (Mean $\pm$ SD)	Partial Eta Squared
2 Min Step (steps)	36.53	76.6 $\pm$ 13.4 <sup>a</sup>	101.0 $\pm$ 14.5 <sup>b</sup>	113.5 $\pm$ 14.5 <sup>c</sup>	0.75
Chair Stands (stands)	44.96	13.3 $\pm$ 3.9 <sup>a</sup>	18.4 $\pm$ 5.2 <sup>b</sup>	22.1 $\pm$ 5.2 <sup>c</sup>	0.78
Arm Curls (repetitions)	30.69	13.6 $\pm$ 2.9 <sup>a</sup>	18.7 $\pm$ 4.9 <sup>b</sup>	22.4 $\pm$ 4.3 <sup>c</sup>	0.70
8 Foot Up and Go (s)	34.58	7.3 $\pm$ 1.6 <sup>a</sup>	5.9 $\pm$ 1.3 <sup>b</sup>	4.8 $\pm$ 1.0 <sup>c</sup>	0.73
Chair Sit and Reach (in)	15.06	-1.18 $\pm$ 3.3 <sup>a</sup>	0.59 $\pm$ 1.4 <sup>b</sup>	1.38 $\pm$ 1.6 <sup>c</sup>	0.54
Back Scratch (in)	16.50	-1.9 $\pm$ 3.9 <sup>a</sup>	-0.54 $\pm$ 3.5 <sup>b</sup>	0.07 $\pm$ 3.4 <sup>c</sup>	0.56

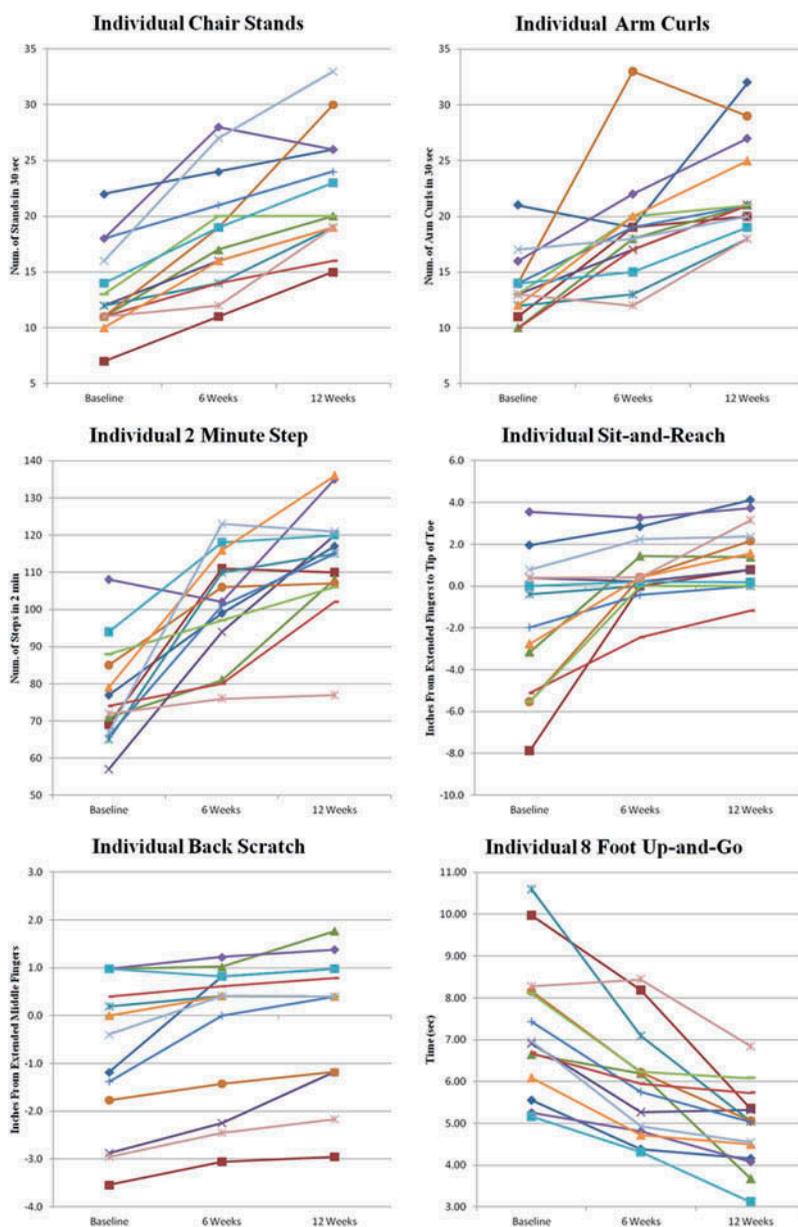
Note. Superscripts that differ indicate a significant difference across time points ( $p < 0.05$ )

## Results

Results from ANOVA with repeated measures suggested there was a significant change over time for all measures of the SFT ( $p < 0.001$ ). Partial eta squared ranged from 0.54–0.75 (depending on the subsection of the SFT), indicating 54–75 % of the variability in SFT scores was accounted for by time across the duration of the study. Post-hoc analysis using a Bonferroni correction indicated there were significant improvements in all measures of the SFT across all three time points (Table 1). Overall attendance for the group was  $78 \pm 11\%$  for all sessions. The main reasons for absences from a yoga session were illness (42%) or other obligations (58%). No incidence of injury or discomfort was reported during the 12-week program. There was no significant correlation between attendance and changes in SFT scores ( $p > 0.05$ ). All individuals showed an overall improvement in their SFT scores from baseline to 12 weeks across all tests (Figure 1). However, some individuals declined or plateaued between 6 and 12 weeks. The participants' initial baseline score was negatively correlated with their total change from baseline to 12 weeks in 3 of 6 measures in the SFT (Table 2). Comparison of the yoga group's SFT scores with normative data showed participants in the lower percentiles shifted toward higher percentiles from baseline to 12 weeks (Table 3).

## Discussion

The present study examined the effects of a new yoga program for older adults, Rewind Yoga™, on physical function in older adults. Our results indicate Rewind Yoga™ has the potential to help older adults improve strength, balance, and function as measured by the SFT. Along with mean improvements across all measures of the SFT, there was relatively small individual variability with all participants improving from baseline to 12 weeks (Figure 1). Participants who started with higher physical function scores at baseline saw smaller improvements in their scores after 12 weeks of Rewind Yoga™ in several of the SFT measures (Table 2.)



**Figure 1.** Individual change scores from the SFT across time, baseline, 6 weeks, and 12 weeks.

The SFT utilizes measurements of specific physical parameters that target functions such as walking, standing up from a chair, bending/kneeling, lifting/reaching, and stair climbing. Meaningful improvements in the aforementioned parameters logically lead to improvements in activities of daily living such as personal care, housework or shopping, along with protection from injury or falls (Rikli & Jones, 1999a). We analyzed the participants' pre and post scores with the published SFT normative data as a means to estimate meaningful improvement.

**Table 2.** Correlation between participants' baseline SFT scores ( $n = 14$ ) and overall change in SFT scores at 12 weeks

	$r$	$r^2$	$P$
2-Minute Step (steps)	<b>-0.55</b>	<b>0.30</b>	<b>0.04</b>
Chair Stands (stands)	-0.19	0.04	0.52
Arm Curls (repetitions)	-0.10	0.01	0.72
8 Foot Up and Go* (s)	<b>0.80</b>	<b>0.64</b>	<b>0.001</b>
Chair Sit and Reach (in)	<b>-0.88</b>	<b>0.77</b>	<b>&lt;0.001</b>
Back Scratch (in)	-0.47	0.22	0.09

Note. A lower score on the 8 Foot Up and Go is indicative of better function.

**Table 3.** Frequency of percentile rankings using normative data baseline and 12 weeks

	Baseline		12 Weeks		$p$ value
	Below 50 <sup>th</sup> percentile $n$ (%)	Above 50 <sup>th</sup> percentile $n$ (%)	Below 50 <sup>th</sup> percentile $n$ (%)	Above 50 <sup>th</sup> percentile $n$ (%)	
2 Min Step	12 (85.7)	2 (14.3)	1 (7.1)	13 (92.9)	<b>0.001</b>
Chair Stands	10 (71.4)	4 (28.6)	1 (7.1)	13 (92.9)	<b>0.004</b>
Arm Curls	10 (71.4)	4 (28.6)	0 (0)	14 (100)	NA*
8 Foot Up and Go	11 (78.6)	3 (21.4)	3 (21.4)	11 (78.6)	<b>0.008</b>
Chair Sit and Reach	10 (71.4)	4 (28.6)	5 (35.7)	9 (64.3)	0.063
Back Scratch	7 (50.0)	7 (50.0)	4 (28.6)	10 (71.4)	0.250

Note. The  $p$ -value for the arm curls could not be calculated because the below 50<sup>th</sup> percentile had no counts at 12 weeks.

Comparison of the participants SFT scores to the normative data people the same age revealed the majority of the participants were at or below the 50th percentile (Rikli & Jones, 1999b) at baseline. After 12 weeks, there was a significant increase in the number of individuals above the 50th percentile compared to baseline for the 2 Min Step, Chair Stands, and 8 Foot Up and Go (Table 3). These changes in percentile indicate a meaningful functional improvement from below to above average functional health relative to the age of the participants following 12 weeks of Rewind Yoga™. An effect size analysis of the repeated measures ANOVA showed a substantial amount of the variability seen in the SFT scores from baseline to 12 weeks were due to the time factor where participants were practicing Rewind Yoga™ (Table 1).

### Limitations and future research

The primary limitation of this study was the use of a single-group, quasi-experimental design with no control or comparison group. Randomization and inclusion of a control group would have strengthened the design of this study and the implications of the results on physical function. However, this study was intended to be a preliminary study to see if further research of the effects of Rewind Yoga™ on physical function was warranted.

Based on our results, future research is warranted using Rewind Yoga™ as an intervention to improve balance and physical function. A randomized control trial design in a community setting would help to further elucidate the just how effective Rewind Yoga™ might be for older adults. In a review on the impact of yoga on balance in a healthy population, Jeter and colleagues (2014) reported that in spite of evidence that yoga can improve balance and function, more studies are needed with clear balance outcomes measured (Jeter et al., 2014). For future studies, sensitive and valid measures of balance (e.g., center of pressure), function, physical activity (e.g., accelerometer), and quality of life would be beneficial to assess a broader impact Rewind Yoga™ may have on an individual's physical health.

### **Conflict of interest**

This study was designed and initially carried out by the company, YMEDICA, as part of their exploration on the effect of Rewind Yoga™ on balance and function. The statistical analysis and interpretation of the results were conducted by researchers at Arizona State University (ASU). Carrie Hensley was paid as a contractor from YMEDICA to teach the Rewind Yoga™ classes and Dr. Heidi Ungar was paid as a contractor from YMEDICA to perform the measures of the Senior Fitness Test. The ASU affiliated authors of this article received no compensation, monetary or otherwise by YMEDICA or any other company for their involvement in this study.

### **Conclusions**

Rewind Yoga™ appears to be beneficial for improving flexibility, strength, dynamic balance, and muscular endurance in older adults as measured by the SFT. Based on this study's findings, more research is warranted to better determine the effectiveness of Rewind Yoga™ with older adults in a community setting.

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