COMPARING FALL RISK OF OLDER ADULTS IN A COMMUNITY-BASED FITNESS PROGRAM TO NON-PARTICIPANTS

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Abstract

Community dwelling older adults will fall at least once a year which can lead to multiple adverse outcomes. However, the long term effect of structured community based fitness programs is unclear in age and sex matched individuals. **PURPOSE:** To compare predictors of fall risk in older adults who regularly exercised between 2-3x/wk in a community based fitness program for a minimum of a year (CDAE) to an age and sex matched group who had not (CDA). **METHODS:** 19 CDAE were matched and compared to 19 CDA [38 adults, 30 females and 8 males, 63-84 yrs (M=74.2±6 yrs)]. All participants were asked to report the number of falls in the previous year. The Balance Self Efficacy Scale (BES) was administered to establish the level of confidence in the participants' ability to perform activities of daily living (ADL). Fall risk was assessed by the Fullerton Advanced Balance (FAB) Scale. The APDM (Ambulatory Parkinsons' Disease Monitoring) Movement Monitoring Solutions, Mobility Lab™ System was employed to assess components of the Instrumented 25 ft Timed Up and Go (I-TUG) which included number of steps to complete the turn around the cone (NS), turn time around the cone (TT), time to complete a full sit to stand (SS), beginning sit to stand velocity of the trunk (SSV) and gait cadence (GC). Differences in age and sex matched groups were evaluated using paired t-tests. **RESULTS:** 5 CDAE (26.3%) experienced one fall within the previous year compared to 12 CDA (63.2%) who fell which was significant (p=0.004). Of the 12 CDA who fell, 2 had 3, 4 had 2 and 6 had 1 for a total of 20 falls. In the BES, group responses were significantly different (p=0.012); both CDAE and CDA self-reported confidence in not falling during ADL (M=91.2%±7.6 SD and 80.3%±14.2 SD; ≤50% predicts fall risk). However, the FAB predicted falls (score ≤25) in 2 (11%) CDAE and 7 (37%) CDA; paired group scores were significantly different (M=31.2±4.3 SD and 27.6±7.0 SD, p=0.039). In the I-TUG the only significant difference between groups was TT (p=0.015). NS (p=0.243), SS (p=0.464), SSV (p=0.106) and GC (p=0.511) were not significantly different between groups. **CONCLUSION:** Self-assessment (BES) does not predict fall risk as effectively as actual measurements (FAB and I-TUG TT) in older adults whether they regularly exercise or not. However, participation in community based fitness programs can significantly reduce both the number and risk of falls in older adults.

Purpose

The purpose of this study was to compare balance performance, confidence and fall risk in subjects who participated in the Young at Heart Fitness Program (Healthy Aging Association, 2012) for at least a year to inactive, age and sex matched, counterparts who self-referred to balance screening to assess the risk of falls.

The study utilized the BES to initially assess balance confidence. The subjects then performed a series of tests to assess fall risk using the 25-foot ITUG. This was followed by tests assessing functional balance performance utilizing the FAB scale.

Introduction

A review of the literature revealed that there is considerable research that supports exercise as probably the best way to prevent falls. One meta-analysis has shown that exercise can prevent falls in older adults and that the grouped estimate of the effect of exercise reduced the rate of falling by 17% (Sherrington et al., 2008). However it was not predictable that a non-exercise control group of high-functioning older adults would score less on testing when compared to exercising counterparts. There is great variety in the numbers and types of exercise classes available in most communities for older adults and it is intuitive that they would have an effect; a meta-analytic review confirmed exercise as a single intervention in fall prevention and suggested that general community based programs be undertaken for at least 2 hours per week on an ongoing basis (Sherrington, Tiedemann, Fairhall, Close, & Lord, 2011). Most reports of exercise benefits to reduce the risk and number of falls are anecdotal and there is a limited information pool available analyzing evidence-based programs. In this day and age of shrinking resources, the decision to provide community based exercise programs based on evidence rather than intuition warrants further study in the area of comparing high-functioning older adults who were not pre-screened to be at risk for falls. The Young at Heart fitness program is ongoing but has not in the past used evidence-based data to support its effort.

Methods

SUBJECTS:
The control group, 15 females and 4 males, was a sample of convenience drawn from a population of adults who had not exercised for a minimum of a year and who had self-referred to a balance screening offered through the SAFE (Senior Awareness & Falls Education) Coalition in conjunction with the Department of Physical Therapy at California State University, Fresno (CDA). The experimental group, (15 females and 4 males), was drawn from a population of adults who had exercised for a minimum of a 1 year in the Stanislaus County, CA, Young at Heart fitness program (CDAE).

PROCEDURES:
The BES (Rose, 2003), a self-reported questionnaire, was used to establish the level of confidence in the subject's ability to perform ADL. The FAB Scale was used to measure functional balance Performance (Hernandez, & Rose, 2008). The ITUG was then performed using the APDM Movement Monitoring Solutions, Mobility Lab™ System. The Mobility Lab™ System consist of 6 Opal Movement Monitors that combine multiple sensors (a tri-axial accelerometers, tri-axial gyroscope, and tri-axial magnetometer) into small devices that connects wirelessly to an access point. Figure 1, shows placement of Inertial Measurement Units (IMU) Opals. The test consisted of a sequence of sit to stand, walking, turning around a cone, and finally a stand to sit task (Zampieri et al., 2010). Participants filled out the health history questionnaire, where they were asked, "How many times have you fallen in the last year?" 'Fall' was defined as "unintentionally coming to rest on the ground, floor, or other lower level." The number of falls within the past 12 months was recorded in both CDA and CDAE.

Figure 1: Placement of Opals

STATISTICAL ANALYSIS:
This study was a non-equivalent two group post-test only design with matched pairs for age and sex. Subjects were not randomly assigned to the comparison groups since they had already been established in two separate communities. Pairs were matched by age and sex to reduce the effect of confounding extraneous variables, and was analyzed using a paired t test. For all statistical tests, significance was set at p<0.05. Descriptive statistics (means and standard deviations) were also calculated for all variables. Post hoc power and effect size (Cohen's d) calculations were made for all dependent variables except the number of falls. The APDM Mobility Lab™ software provided raw data by subject. The data was exported and analyzed using SPSS version 22.0.
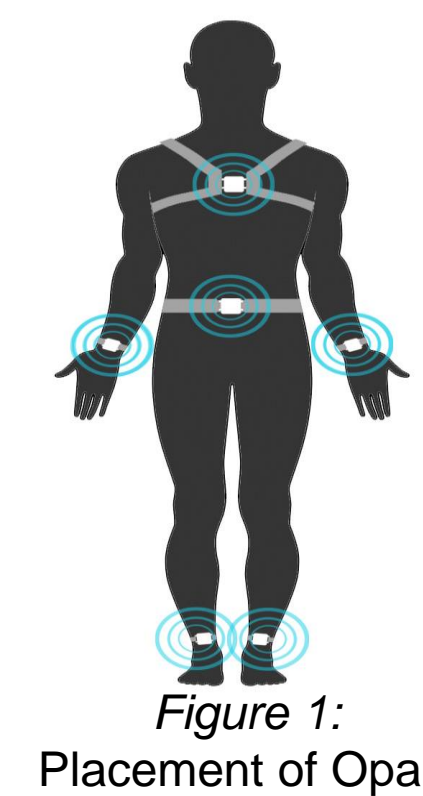
Results

Two groups of community dwelling older adults, one which had exercised for a year and one which had not, participated in an assessment of their balance confidence, functional balance performance, fall risk as identified by five ITUG measures, and number of falls. Significant differences between groups were observed for balance confidence (p=0.012), functional balance performance (p=0.039), fall risk as assessed by turn time in the ITUG (p=0.015) and number of falls (p=0.004). No differences were observed in ITUG steps to complete the turn around the cone (NS) (p=0.243), time to complete a full sit to stand (SS) (p=0.464), sit to stand trunk velocity (SSV) (p=0.106) and gait cadence (GC) (p=0.511).

Table 1: Balance Efficacy Scale Comparisons Between Community Dwelling Older Adults Who Exercised (CDAE) and Those Who Did Not (CDA)

Group	Mean ± SD	SEM
CDAE (n=19)	91.2%±7.6%*	1.741
CDA (n=19)	80.3%±12.2%	3.259

Note. Values are means ± SD, *p=0.012

Table 2: Fullerton Advanced Balance Comparisons Between Community Dwelling Older Adults Who Exercised (CDAE) and Those Who Did Not (CDA)

Group	Mean ± SD	SEM
CDAE (n=19)	31.2±4.3*	0.989
CDA (n=19)	27.6±7.0	1.606

Note. Values are means ± SD,*p=0.039

Table 3: Number of Falls Comparisons Between Community Dwelling Older Adults Who Exercised (CDAE) and Those Who Did Not (CDA)

Group	Number of Falls	Mean ± SD	SEM
CDAE (n=19)	5	0.26±0.5*	0.104
CDA (n=19)	20	1.05±1.0	0.235

Note. Values are means ± SD, *p=0.004

Table 4: ITUG Comparisons Between Community Dwelling Older Adults Who Exercised (CDAE) and Those Who Did Not (CDA)

	CDAE	CDA	Mean ± SD	p value
TT (seconds)	1.80±1.32	3.00±1.32	-1.2±1.9	0.015*
NS (count)	6.63±0.90	7.11±1.70	-0.5±1.7	0.243
SS (seconds)	2.45±0.38	2.34±0.47	0.1±0.7	0.464
SSV (degrees/sec.)	136.93±50.40	112.93±36.09	24.0±61.5	0.106
GC (steps/min.)	118.36±11.89	116.05±11.36	2.3±15.0	0.511

Note. Values are means ± SD, *Statistically significant

Conclusions

In summary it was shown that community dwelling older adults who participated in the Young at Heart fitness program for a year had better confidence in their balance, better functional balance performance, and a lower number of falls in a year as compared to their age and sex matched, non-exercising, counterparts. Since the subjects were age and sex matched, the natural decline of physical function associated with aging was addressed and was not a major factor in comparing both groups. This suggests that exercise alone, regardless of the structure of the program, had a positive effect on the reduction of the risk and number of falls in older adults.

Acknowledgment

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