

University of Nevada, Reno

Analysis of the Reno Fit and Strong Program

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Program

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ABSTRACT

Many older adults are not exercising as much as the CDC recommends. There are programs in place to combat this issue, such as the Fit and Strong exercise program offered by the Sanford Center for Aging. In order to make sure these programs are effectively improving the health of the older adults in the community, it is important to conduct evaluations. The Fit and Strong Program collects subjective data in the form of a survey that the participants complete before and after the program. To offer a more objective approach, this study implemented three clinical tests to determine if the participants increased in strength, speed, balance, and flexibility. Once the data was evaluated, the results showed a significant change in all three tests. These results can be utilized to support further implementations of and funding for Fit and Strong and similar programs.

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Exercise is an important preventive measure when it comes to maintaining health and wellbeing, and becomes increasingly more important as people age. Although the importance of exercise is well documented, many older adults are not getting the appropriate amount of exercise. One way to counteract this issue is to offer community based older adult exercise programs. One program that is currently implemented in Reno is the Fit and Strong Program. This program was created at the University of Chicago in Illinois. It is an eight week program that incorporates aerobic and resistance training, as well as an educational lesson each class. In order to ensure that this program is benefitting the older population it is important to evaluate the program. This has been done previously with self-reported survey data. Though this data provides subjective evidence that the program is effective, the addition of objective clinical tests can strengthen the argument for this program and other exercise classes.

INTRODUCTION

In order to fully recognize the impact a program such as Fit and Strong can have, and the importance of evaluating its effectiveness, it is crucial to first establish the effect exercise has on older adults. It is essential to assess the barriers and motivators that keep older adults from, and encourage them to, maintain an active lifestyle. Understanding these factors can then lead to the development of effective evidence based programs, such as the Fit and Strong program. Although there has been an abundance of research in these areas, as well as significant data supporting Fit and Strong and other evidence based programs, there is a need for more objective data to support their effectiveness. Typically,

these programs have been supported in the literature with surveys that have the participants self-reporting their health and wellbeing before and after the program. Though this evidence is crucial in supporting the efficacy of these programs, the presence of more objective tests can provide important insight into the effectiveness of these kinds of exercise programs. This type of data has not been analyzed as frequently, especially for the Fit and Strong program. Before this disparity can be addressed, it is important to understand why these programs are important, how the participants are motivated, and what makes them effective.

Benefits of Exercise

Many studies have documented the physical decline that is traditionally part of the aging process. Typically people will lose cardiorespiratory endurance as well as muscle strength and endurance. Cardiorespiratory endurance can be effectively measured using a VO₂ max test. This tests measures maximal oxygen consumption and can determine how effectively the body is utilizing the oxygen it takes in. A decline in VO₂ max is inevitable with age, but the decline is much slower and smaller when the adult remains active (Vaitkevicius et al., 2008). Maintaining cardiorespiratory endurance is important to be capable of activities of daily living. Simple daily tasks such as chores, cleaning, and even just walking require that the adult has some level of cardiorespiratory endurance. A large decline in cardiorespiratory endurance can even lead to chronic diseases and disability.

Aerobic activity later in life can help maintain or even increase VO₂ max for older adults. Older adults who participate in aerobic activity increase their oxygen consumption and aerobic capacity (Vaitkevicius et al., 2008). The increase in aerobic capacity has

other benefits as well such as lowering resting heart rate and systolic blood pressure (Vaitkevicius et al., 2008). All of these positive results of aerobic exercise will help older adults stay active longer and lower their risk for chronic diseases.

Muscle strength and endurance also tend to decline as one ages. There are many theories as to why this occurs including a decline in cross sectional area, increase in adipose tissue, and fewer motor units (Delmonico et al., 2009). These different declines can often be attributed to a sedentary lifestyle. As one ages, the subcutaneous fat infiltrates the muscle tissue, and even when there is not a decline in muscle size, this can lead to a decline in strength (Delmonico et al., 2009). Even so, older adults have still shown a large decrease in cross section area of the lower extremities, particularly the quadriceps (Delmonico et al., 2009). This decline in size and strength can lead to loss of function. If the older adult does not have adequate leg strength, they can lose their ability to be mobile and even become wheelchair bound.

Because maintaining muscle strength and muscle mass is so important, it is recommended that older adults not only participate in aerobic activity, but also include some form of resistance training. When including lower extremity resistance training, older adults were able to significantly improve their leg press and knee extension (Straight et al., 2016). Older adults can still make improvements to their muscle strength and power even later in life. These improvements can help the older adult remain active and independent for a longer period of time.

Barriers to Exercise

The benefits of exercise for older adults is well documented. Though there is this strong support in favor of leading an active lifestyle, many older adults are still not getting the appropriate amount of exercise. The first step in solving this problem is to understand what barriers are in the way of getting older adults exercising. One of the largest barriers documented in the literature is health concerns, including a fear of potential injury, the insecurity that they will fall behind or slow down the class, or the concern that they will not be fit enough to even complete the intended exercises. In many cases, older adults are afraid to begin exercising, as they believe that they will injure themselves if they even try to exercise (Costello et al., 2011). Many older adults also believe that pre-existing health concerns will hinder them from completing the activities involved in an exercise class or even the exercises they can complete at home (Newson & Kemps, 2007). That insecurity can lead to embarrassment, further hindering the older adult from taking the initiative to start a class. Another similar issue that many older adults experience is that they feel that they will hold the class back, or slow them down (Hardy & Grogan, 2009). This feeling can lead to social insecurities as well.

The second highest documented barrier is lack of time. Although it is often assumed that older adults are retired and revel in their leisure time, this is far from the truth for much of the older population. Lack of time is one of the largest deterrents from exercise in the older population (Costello et al., 2011). For example, many older adults are very active in their communities, volunteering for various organizations and providing care for family members like parents, children, or grandchildren. If one does not prioritize exercise and plan it into their schedule, they will not be able to maintain an

active lifestyle. Also, for the busier older adults, if classes and programs are not compatible with their schedule, they may not be able to participate.

Some of the other barriers discussed in the literature are low accessibility to programs, low motivation, and expenses (Beidenweg, 2014; Hardy & Grogan, 2009). Both the barriers of low accessibility and the expenses involved with the programs can be easily solved. If resources are allocated, communities could offer more classes in different areas for lower costs. These funds could be seen as an investment in keeping older adults healthy, to save money on medical expenses in the future. Motivation is a trickier subject. In order to cater to the needs of this population, it is important to look into what motivates them to exercise.

Motivators to Exercise

Older adults report that one of the largest motivators for them to exercise is to maintain or improve their health. Elders who have a personal or family history of a chronic disease or illness were more likely to exercise in order to avoid that same disorder (Costello et al., 2011). A common theme was exercising as an attempt to prevent health decline (Hardy & Grogan, 2009; Newson & Kemps, 2007). Many people of the older generation are afraid to lose functionality and independence, so they exercise to stay fit and healthy.

Though staying healthy is a great motivator, it stems mostly from a fear of disability. There are other more positive motivators documented as well. One example is exercising to socialize. Exercise groups and classes can be a great opportunity for older adults to meet and interact with the people in their community. They can get more

support and encouragement from the people in their class (Petursdottir, Arnadottir, & Halldordottir, 2010). This positive motivator was supported as one of the top reasons that older adults exercise by multiple studies (Costello et al., 2011; Newson & Kemps, 2007; Hardy & Grogan, 2009; Beidenweg, 2014).

Another strong motivator to get older adults exercising is the presence of a coach. This addition gives the elder the peace of mind that they are performing the activity properly and provides ideas of what exercises they should be completing. They tend to enjoy the programming aspect, the structure and planning of the workout, that the coach provides (Costello et al., 2011). The coach also instills a sense of motivation and accountability. Quality coaches tend to make the participants feel safer, more comfortable, and give them a reason to come to class or continue exercising.

Along with the external motivators, there are also internal motivators as well. Some older adults are motivated to exercise because it is enjoyable and allows them to feel more confident (Hardy & Grogan, 2009). They are also more motivated to exercise if they find it enjoyable or even fun (Costello et al., 2011). Others start or continue exercising to better their self-image and self-perception (Petursdottir, Arnadottir, & Halldordottir, 2010).

Qualities of Strong Programs

Keeping these barriers and motivators in mind, there has been research on the most effective ways to get older adults to exercise. The programs that have the greatest benefits were typically supervised by a trained coach and group based (Lacroix et al., 2017; Avers, 2010; Hayashi et al., 2018). Programs that include a coach or some sort of

supervisor are more effective than those that are unsupervised (Lacroix et al., 2017). This could be due to the sense of motivation and accountability that comes from the supervisor. When programs are unable to have constant supervision, partial supervision works better than none at all. Some programs are also moving toward the possibility of incorporating different supervisory stages, where they start with complete supervision, move to moderate supervision, and then allow the participants to work on their own (Lacroix et al., 2017). Ultimately, the presence of some sort of coach or instructor is a crucial part of an older adult exercise program. It is also important to select the appropriate instructor. The ideal coach for an older adult exercise program should create a sense of safety, be agreeable and approachable, and be knowledgeable in both exercise and aging (Avers, 2010).

Older adults are perceptive to the idea of a group setting that is partially supervised and partially completed at home as described above (Mehra et al., 2016). This model allows older adults the benefits of a group setting and the frequency allowed by including a home aspect. The participants utilizing this model enjoyed the social connections and supervision they received in the group setting. One of the greatest benefits for older adults in the group exercise design is building relationships that can keep them motivated and accountable. After the sessions with the group, the participants were then more motivated and possessed more self-efficacy, allowing them to complete the exercises on their own as well (Mehra et al., 2016).

In one particular study, an experimental group who exercised in a group setting fell less often than those who exercised alone, even when the duration of exercise was controlled (Hayashi et al., 2018). The researchers developed a few hypotheses to describe

this occurrence including physiological, psychological, and social explanations. One explanation is that the group setting offered social support leading to higher self-esteem and quality of life. Physiologically, the presence of a coach or leader as well as other participants was helpful in fostering collaboration amongst the group to maintain an appropriate intensity for the exercises. The other participants were also able to offer strategies and motivation. The participants involved in the group showed lower rates of depression as well (Hayashi et al., 2018).

Presence of a coach and group setting are two of the better documented aspects of successful interventions, but there are other important considerations to take as well. According to Avers (2010), it is crucial to find the ideal space, size, and population to run an effective program. The ideal space will be large enough for the size of the class, and have open space for exercising. The location should also be accessible to the population the program is intended for. The size of the class should depend on how many instructors there are as well as how much attention each participant will need. Finally, the participants of the class should ideally be of similar age and skill level. This factor is the most desirable for the older population (Avers 2010).

Fit and Strong

Fit and Strong is a strong example of an evidence-based program that incorporates many of the favorable qualities mentioned above. It is an evidence-based program developed at the University of Chicago in Illinois. Since its conception, the program has grown and spread to many different states around the U.S., including Nevada. The

program was designed to help older adults with osteoarthritis stay in shape and improve their joint functioning, despite their chronic disease (Hughes et al., 2004).

The original goal of the program was to utilize low cost and readily available equipment (Hughes et al., 2004). The course would teach the older adults how to effectively exercise and use the equipment, with hopes that they would be able to purchase their own set and continue exercising on their own. The program focuses on the long term. Fit and Strong adds an educational component that not only teaches the participants certain exercises, but also teaches them about the importance of exercise and how to set goals and overcome barriers (Hughes et al., 2006). The class places a large emphasis on self-efficacy and adherence to their regimen (Hughes et al., 2006). By the end of the program, the goal is to have the older adults feel that they are capable of reaching their exercise goals and continue to exercise on their own.

In the first evaluation of the class, Hughes et al. (2004) found that the results did not have a statistically significant change in the physical fitness of the participants. There was no change in lower extremity strength, and little change in their endurance (Hughes et al., 2004). However, this program was only eight weeks long. After engaging in consistent exercise for a longer period of time, there could be more significant changes. Though there were not significant changes in strength, the program did have many positive outcomes. For one, the class had a very low attrition rate (Hughes et al., 2006). This means that the participants remained in the class, leading to the conclusion that they were either enjoying the class, or saw benefits from participating. There were also large increases evaluated in their self-reported self-efficacy and adherence to the program

(Hughes et al., 2004; Hughes et al., 2006). The participants felt stronger and more capable after the program and continued their own exercise plans beyond the program.

This program has now been adopted in many areas all over the country. The institutions that incorporated the Fit and Strong Program did so because many appreciated the fact that it was evidence-based and proved to be effective (DerAnanian et al., 2012). They also enjoyed the fact that the program was structured, providing planned workouts and curriculum (DerAnanian et al., 2012). Fit and Strong has strict guidelines that help all locations stay on track and find the same results. The program also provides support to those who have incorporated it, including formal instructor training (DerAnanian et al., 2012). All of these reasons separated the Fit and Strong program from other similar classes, making it more desirable for local community centers to implement it.

One other interesting aspect of this program is that the coach can be a physical therapist or a certified exercise instructor (CEI). When the program first began, all classes were led by physical therapists. As the program expanded, Fit and Strong started training CEIs to increase the availability of the program. The Reno program is one example of a class that is led by a CEI. When evaluated, the programs led by a physical therapist had greater increases in self-efficacy because of the focus that the therapists put on perfecting the exercises and making sure the participants are doing them properly (Seymour et al., 2009). There was no difference found between adherence, pain reduction, or strength in the study comparing physical therapists to CEIs (Seymour et al., 2009). Since this study was conducted, Fit and Strong has increased the amount of training for their CEIs. Overall though, Fit and Strong has proven to be a valuable and reliable program that

makes its participants feel more confident in performing the exercises and exercising regularly.

All of this literature supports the need for and the importance of older adult exercise programs. Many of the studies currently utilize more subjective self-reported survey research to support their performance. Along with this data, it would be beneficial to have objective data from clinical tests that support the current subjective data. This evidence would have the ability to strengthen the advocacy of these programs, or potentially offer areas of possible improvement. Comparing the two types of data collection could be very insightful in understanding how these programs can most effectively benefit the older population. Knowing that this current weakness exists, I will be implementing a quantitative test to the Fit and Strong program in Reno to evaluate its effectiveness.

METHODOLOGY

Before beginning the assessments, a literature review was conducted to determine which clinical tests would be most useful to test strength, balance, and flexibility. Three assessments were selected. The 30 Second Sit to Stand test and the Timed Up and Go Test were selected to test leg strength and balance respectively; the Functional Reach Test was selected to test flexibility. Once the tests were determined, approval to work with the Fit and Strong Program was obtained from the Sanford Center for Aging. The Fit and Strong program also includes a survey that collects data for the national program. The Sanford Center for Aging gave approval to analyze the results of this survey. A

protocol for the clinical tests and survey data was developed and Institutional Review Board (IRB) approval was received.

Upon approval by the Sanford Center for Aging and the IRB, the participants were recruited. Participants selected for the study were a part of the class to accurately assess its effects. On the first day of the class, the participants were recruited to participate in the study. The tests were explained thoroughly to the participants and any risks were identified.

Of the twenty two participants registered for the class, seventeen participants agreed to participate and completed the pre-testing. Some participants decided not to participate in the program, while others joined the class too late, and were not able to be tested early enough. Of the participants who were evaluated, fifteen were female and two were male. This uneven distribution paralleled the makeup of the class, as there were only three male participants.

On the first week of the class, the clinical tests and survey were administered either before or after the lesson and workout for the day. The three clinical tests utilized were as follows:

30 Second Sit to Stand Test

For this test, an armless chair was placed against a wall. The participant was instructed to start seated in the chair. The researcher then explained the exercise by telling the subject they would stand completely up out of the chair, and sit all the way back down as many times as they could in a 30 second time period. They were informed not to use their hands to push off of the chair or off of their legs in order to test strictly

the strength of their quadriceps muscles. The participants were cautioned to only complete the activity as long as they felt safe. They were allowed to reach down and touch the chair if they felt unstable. The researcher modeled the test one time if the participant wanted to see an example. Once the test was explained, the participant was permitted to complete one trial round consisting of standing and sitting back into the chair one time. Once they were ready, the researcher told the participant to start and simultaneously began timing. During the trial, the researcher counted every time the participant completed one cycle. After 30 seconds, the amount of complete trials completed was documented.

Timed Up and Go Test

To set up for this test, another armless chair was placed a couple feet from the wall. From the front foot of the chair, three meters was measured and a piece of tape was placed on the ground to mark the distance. For this test, the participant began seated in their chair. They were instructed to stand up out of the chair and walk past the piece of tape placed three meters away. After they walked past the tape, they would turn around, return to the chair, and sit back down. The researcher modeled this test for the participants that wanted an example. Once the participant was ready, the researcher instructed them to start and simultaneously started a stopwatch. The trial was completed once the participant sat back down into the chair. Once one trial was completed, the researcher stopped the stopwatch. The time from the instruction to begin to the moment the participant sat back down into the chair was recorded.

Functional Reach Test

The set up for this assessment included a meter stick taped to a wall and a mark placed on the floor at the base of the meter stick. To begin, the participant placed their toes behind the line marked under the meter stick. The participant was instructed to raise their right arm, the arm closer to the wall, directly in front of them. The distance that their arm reached out to naturally was recorded in centimeters. The participant was then instructed to flex at their hips and reach forward as far as they could. They were warned not to bend at the knees or extend their shoulder which would cause their arm to raise higher. The furthest point that they could reach was then recorded in centimeters. The original distance was subtracted from the final distance to obtain the total distance reached.

Fit and Strong Protocol

Once all of the pre-data was collected, the participants completed the eight week Fit and Strong course per the design of the original program. The Fit and Strong program was designed at the University of Illinois at Chicago by the public health department. The program is eight weeks long and the participants meet for an hour and a half three days a week. The program includes cardiovascular conditioning, strength training, flexibility, balance, and an educational component.

During the first week of the class, each participant is fitted with an ankle weight. The load of the weight is determined by having the participant complete a few leg extensions from a seated position with 5 pounds in their ankle weight. The participants could remove or add weight accordingly based on how much the participant was able to lift in the trial. Each class begins with a warm up. The participants will stretch, practice

balancing, and complete some sit to stands. Once they are warm, they will go for a walk either inside or outside depending on the capabilities and preference of the participant.

The class began with a 20 minute walk, but worked their way up to a 30 minute walk by the end of the program. The pace of the walk was determined by the participants, but they were asked to strive for moderate exertion, which was self-evaluated each class on a scale of 1-10 for perceived exertion. The participants were encouraged to strive for an exertion level between 4 and 6.

After the walk, the participants would return and put on their ankle weights. They would complete the following exercises with their weights: knee raises, leg extensions, hamstring curls, lateral leg lifts, and posterior leg lifts. They would complete two to three sets of ten to twelve repetitions depending on the day and progression of the program. Every couple of weeks, the participants were encouraged to increase their weight by half a pound. They would also complete upper body strengthening activities including bicep and tricep curls using a band. The class would finish with a cool down and then an educational session. In the educational session, they would discuss subjects such as appropriate footwear, ways to overcome barriers to exercise, and how they would maintain an active lifestyle after the program.

Though a brief description of the program was described, the Reno class strictly followed the protocol developed by the Fit and Strong program. The specific details of the program and progressions can be found by contacting the Fit and Strong program or on their website.

Post Class Data Collection

On the last week of classes, the participants who agreed to participate in the study were asked to complete all three tests again to collect the post program data. Two of the participants had to be eliminated from the study. One participant was not available on the week of the post-testing, while the other participant had to drop the class due to a medical procedure. The exact same three tests were administered using the same protocol. The outcomes of the tests were recorded. The participants also completed the post-program survey. Six survey questions were selected to be analyzed based on their association with the clinical tests. The questions that reviewed the participants' confidence in exercising and perceived ability to complete different aspects of exercise programs were deemed the most useful and pertinent.

Once the data was collected, the post-program information was compared to the pre-program data. These values were compared using paired t-tests with the SPSS software. A separate t-test was utilized for each individual assessment to determine if there were a significant change from the beginning of the class to the end of the class.

RESULTS

The following results are from a population of older adults ranging in age from 60-90 with an average age of 72.4 ± 7.68 . The participants were 14 females and one male. All of the people in the class were from the Reno area and went through the full Fit and Strong curriculum.

Statistical Significance of Clinical Tests

There were some interesting trends found in the data. The most important finding is that there were statistically significant improvements in measurements: strength, agility, and flexibility after the completion of the program (Table 1). The Sit to Stand test, which evaluated the lower extremity strength had a significance of 0.029, ($p \leq 0.05$). The Timed Up and Go test assessed the speed and agility of the participants and had a significance of 0.008 ($p \leq 0.05$). Finally, the Functional Reach test which measured flexibility had a significance of 0.005 ($p \leq 0.05$).

Table 1. Average outcomes of a Sit to Stand, Timed Up and Go, and Functional Reach test before and after participating in the Fit and Strong exercise class and the difference between the two sets.

	Pre-Data Average	Post Data Average	T-Score	Significance
Sit to Stand Test	12.6	14.7	-2.4	.029
Timed Up and Go Test	8.1 seconds	6.9 seconds	3.1	.008
Functional Reach Test	23.5 cm	32.9 cm	-3.3	.005

** $p \leq .05$ meaning results are significantly different*

Comparison to Norm References for the Clinical Tests

In addition to a significant increase in all three of the tests among the fifteen participants, 80% of the participants improved by at least one repetition for their Sit to Stand Test. Eighty percent of the participants also completed the Timed Up and Go test

faster after the program ended as well. For the Functional Reach Test, 87% of participants were able to reach further than they were before they participated in the program.

Table 2. Number and percentage of participants who improved and declined for Sit to Stand, Timed Up and Go, and Functional Reach Test.

	Number of Participants that Improved	Number of Participants Had No Change	Number of Participants that Declined	Percent of Participants that Improved	Percent of Participants that Had No Change	Percent of Participants that Declined
Sit to Stand Test	11	1	3	73	7	20
Timed Up and Go Test	12	0	3	80	0	20
Functional Reach Test	13	0	2	87	0	13

The participants were compared to the norm references for each test. The norm reference scores for the Sit to Stand Test for each age and gender are in Table 3. Eleven of the fifteen participants, 73%, performed above average on their pre-test. All eleven of those participants remained above average on their post-test. Four of the fifteen participants, 27%, performed below average pre-test. All four of these participants remained below average post-test.

Table 3. Sit to Stand below average scores per gender per age group.

Age	Male	Female
60-64	<14	<12
65-69	<12	<11
70-74	<12	<10
75-79	<11	<10
80-84	<10	<9
85-89	<8	<8
90-94	<7	<4

The norm referenced scores for the Timed Up and Go Test are listed by age and gender in Table 4. For the Timed Up and Go Test, the norm references are in ranges of above average, average, and below average speed. As a faster (shorter) time indicates a stronger performance, below average is the strongest score. Nine of the fifteen participants, 60%, scored below average on their pre-test. All of the participants stayed in the below average category in their post-test. Three of the fifteen participants, 20%, scored in the average category for their age and gender. Of those three participants, two, or 66%, moved into the below average category for their post-test. This means that the amount of participants in the below average category increased from 60% to 73% by the end of the class. Three out of the fifteen participants, 20%, began in the above average category. Two of the three participants, or 66%, improved in performance and moved into the average category for the post test. The total amount of participants in the above

average category decreased from 20% (pre-test) to 7% (post-test). Out of the fifteen participants, all but one were in the average or below average at the end of the study.

Table 4. Norm references by age for the Timed Up and Go Test.

Age	Time
60-69 years	8.1 (7.1-9.0)
70-79 years	9.2 (8.2-10.2)
80-89 years	11.3 (10.0-12.7)

The norm values for the functional reach test (Table 5) use a range. It is best to fall in the above average category, as the participant is able to reach further than average. In the pre-test, six out of fifteen participants, 40%, were in the below average category. In the post test, three of those participants, or 50%, remained below average, one participant, or 17%, moved into the average category, and two of the participants, or 33% moved into the above average category. Nine of the fifteen participants, 60%, scored in the average category on their pretest. By the post test, six of those participants, 67%, stayed in the average category and three of those participants, 33%, moved into the above average category. None of the participants scored above average on the pre-test and by the post-test six of the fifteen participants, 40%, scored above average. The number of participants in the below average category went from six, 40%, to three, 20%. Posttest, 12 of 15 participants were in the average or above average range.

Table 5. Norm references by age for the Functional Reach Test.

Age	Men (cm reached)	Women (cm reached)
41-69 years	37.8 ± 5.6	35.1 ± 5.6
70-87 years	33.5 ± 4.1	26.7 ± 8.9

Table 6. Amount of participants that fell into each category of the norm references during the pre-test and the post-test.

	Sit to Stand Pre-Test	Sit to Stand Post-Test	Timed Up and Go Pre-Test	Timed Up and Go Post-Test	Functional Reach Pre-Test	Functional Reach Post-Test
Below Average	4	4	9	11	6	3
Average	N/A	N/A	3	3	9	7
Above Average	11	11	3	1	0	5

Table 7. Percentage of participants that fell into each category of the norm references during the pre-test and the post-test

	Sit to Stand Pre-Test	Sit to Stand Post-Test	Timed Up and Go Pre-Test	Timed Up and Go Post-Test	Functional Reach Pre-Test	Functional Reach Post-Test
Below Average	27%	27%	60%	73%	40%	20%
Average	N/A	N/A	20%	20%	60%	47%
Above Average	73%	73%	20%	7%	0%	33%

Statistical Significance of Survey Results

As per the protocol of the Fit and Strong program, the Sanford Center for Aging also administered a pre and post intervention survey. This survey collected quantitative data in the form of a scale. The survey asked the participants to self-reflect on 50 questions. Of those 50 questions, six were analyzed to determine a significant change based on the self-reported data from the beginning to the end of the program. The first question analyzed asked the participants to evaluate their general health on a scale of 1 to 5, 1 being poor and 5 being excellent. The average score on the survey before the class began was a 3.07 out of 5. When the survey was revisited at the end of the class, the score was a 3.20 out of 5. The average score on this question went up only slightly. Out of the fifteen participants, three scored their general health lower after the class, seven scored their health the same, and five felt that their health was higher after the class. This survey question had a significance of 0.499, ($p \leq 0.05$), there was not a significant difference between the answers in the pre-test and the post-test. The next question asked the participants think about their joint pain and evaluate on how much they feel they are able to do. The answer choices ranged from hardly anything, which was scored as a 1, to everything, which was scored as a 4. The average score before participation in Fit and Strong was 2.93 and after the class the average was 2.86. On this question the average score actually decreased. Of the fifteen participants, four scored themselves as less capable in the post class survey, eight rated themselves the same, and three gave themselves a higher score on capability after the program. This survey question had a

significance of 0.719, ($p \leq 0.05$), meaning that there was not a significant difference between the answers in the pre-test and the post-test.

The next four questions were scored on a scale of 1 to 10, 1 being not confident at all, and 10 being completely confident. The third question asked the participants if they felt confident performing flexibility exercises 3-4 times a week. This question had a significance of 0.005, ($p \leq 0.05$). The fourth question asked the participants how confident they felt in performing muscle strengthening activities 3-4 times a week. This survey question had a significance of 0.250, ($p \leq 0.05$). The fifth question asked how confident the participants felt performing aerobic exercises. This survey question had a significance of 0.008, ($p \leq 0.05$). The sixth and final question asked how confident the participants were in their ability to exercise without pain. This question had a significance of 0.028, ($p \leq 0.05$) (Table 9).

Of the survey questions evaluated, three out of six, 50%, were insignificant while the other 3 had significant changes. The questions that asked about the participants' general health, ability to do what they want to do, and muscle strength found insignificant changes. The questions that asked about confidence in flexibility, aerobic exercise, and exercising without pain found significant changes between the pre-survey and post-survey.

Table 8. Average self-reported scores for six survey questions administered before and after participating in the Fit and Strong exercise class.

	Average Score Pre-Survey	Average Score Post-Survey
Question 1	3.07	3.20
Question 2	2.93	2.87
Question 3	6.80	8.33
Question 4	6.70	7.20
Question 5	7.00	8.70
Question 6	6.13	7.30

Question 1: pertains to general health

Question 2: pertains to perceived ability

Question 3: pertains to flexibility

Question 4: pertains to muscle strengthening

Question 5: pertains to aerobic activities

Question 6: pertains to pain while exercising

Table 9. Number and percent of participants that rated themselves as lower, the same, or higher on survey questions after partaking in the fit and Strong Program.

	Number of Subjects that Rated Lower	Number of Subjects that Rated the Same	Number of Subjects that Rated Higher	Percent of Subjects that Rated Lower	Percent of Subjects that Rated the Same	Percent of Subjects that Rated Higher
Question 1	3	7	5	20	47	33
Question 2	4	8	3	27	53	20
Question 3	1	3	11	7	20	73
Question 4	3	5	6	20	33	40
Question 5	3	2	9	20	13	60
Question 6	3	3	9	20	20	60

Question 1: pertains to general health

Question 2: pertains to perceived ability

Question 3: pertains to flexibility

Question 4: pertains to muscle strengthening

Question 5: pertains to aerobic activities

Question 6: pertains to pain while exercising

Table 10. Average outcomes of the self-reported answers to six survey questions administered before and after participating in the Fit and Strong exercise class and the difference found between the two sets.

	T-Score	Significance
Question 1	-0.70	0.499
Question 2	0.37	0.719
Question 3	-3.29	0.005
Question 4	-1.20	0.250
Question 5	-3.12	0.008
Question 6	-2.45	0.028

** $p \leq .05$ meaning results are significantly different*

Question 1: pertains to general health

Question 2: pertains to perceived ability

Question 3: pertains to flexibility

Question 4: pertains to muscle strengthening

Question 5: pertains to aerobic activities

Question 6: pertains to pain while exercising

In comparing the objective data collected for the study and the subjected self-reported data for the survey, the data from the objective tests had more consistently

significant results. When comparing the significant subjective data to the objective data collected, the strength of the significance was very similar.

DISCUSSION

The study conducted on the Reno Fit and Strong program accomplished the goal of determining the effectiveness of the program. The participants had significant improvements in strength, balance, and flexibility from the beginning to the end of the program. After reviewing the results from the three tests, it is clear the participants increased their fitness level. All three tests had significant changes. The Sit to Stand test had a significance of 0.029, ($p \leq 0.05$). The change seen in the participants can be attributed to the intervention. In addition to finding significant results for the class as a whole, 80% of the participants were able to complete more repetitions of this test during the post-test trials than in the pre-test trials. The participants did increase their lower body strength. In order to complete a sit to stand, the subject must actively engage their quadriceps and gluteus muscles to stand and utilize their hamstrings to lower themselves safely. Since they were able to complete more trials this demonstrates that the participants increased their leg strength.

The Timed Up and Go test also had significant results. The test had a significance of 0.008 ($p \leq 0.05$). The change in the participants after the Fit and Strong program can be attributed to the intervention. The Timed Up and Go test evaluated participants for their balance, speed and agility. Because the participants had to get up from the chair and start moving right away, they proved their ability to balance. The participants had more

stability and balance during the post-test allowing them to have faster times. These significant results are supported by the fact that 80% of the participants decreased their time on this test. Balance is crucial to the quality of life of older adults. Having confidence when rising from a chair and walking can lower the risk of falls and decrease injury in the older population.

The functional reach test had the most significant results with a significance of 0.008 ($p \leq 0.05$). These changes are attributed to the class, but it is important to note that the correlation was very low at 0.128. The participants did have similar changes to one another. Even so, the data are supported by the fact that 87% of the class did increase the distance they could reach. The functional reach test evaluated flexibility. It is clear that the participants increased their flexibility because of the Fit and Strong program. Flexibility helps to keep older adults active and mobile. With increased range of motion comes increased strength and functional movements. This flexibility can lower stiffness and increase the older adults' capacity to complete activities of daily living.

Program Evaluation

Evaluating this program is important to its success. If an exercise program such as Fit and Strong did not find significant results, these varied tests can offer insight into areas of improvement. For example, if the data for the Sit to Stand Test was not significant, the program designers or coaches could work to improve the muscle strengthening portion of the class. Since all the tests had significant results, they can be used to increase funding for this program. The success of this program can also be used to expand the Fit and Strong program to other areas. These results improve the

confidence and self-efficacy of the individual participants. If they are offered quantitative results that support the fact that they are actually getting stronger, they will be more likely to stay motivated and keep exercising after the program ends. Even though some of the participants may have only seen small improvements after the eight week period, they still were able to complete more sit to stands, walk faster, and reach further. This can be a reminder to them that their hard work will illicit the results they desire, and continuing to exercise can allow for even further improvements.

Norm Values

Another interesting finding that came out of the study were the norm values. Many of the participants were able to move out of the category that they started in and reach a higher level by their post-test. In the Timed Up and Go Test, 26% of the participants were able to improve into a higher category. This statistic is even more impressive knowing that 60% of the participants started in the highest category at the start and had no higher category. The Functional Reach Test has 53% of the subjects move into a higher category. These results further support the fact that the participants did improve after the intervention of the Fit and Strong Program.

Another interesting finding that came out of evaluating the norm values were the number of participants that started in average or high categories. For the Sit to Stand test, 73% of the participants started in the above average category. The Timed Up and Go Test had 60% of the participants start below average, which was the highest category, and 20% start in the average category. Sixty percent of the participants began the class in the average category for the functional reach test, though none of the participants began

above average. The overall fitness of the class to begin with was fairly high. The participants were often recruited from other programs for older adults in the community such as the Osher Lifelong Learning Institute and Sanford Center programs. With that target audience, many of the older adults recruited for the program were high functioning and already active. If the starting point of the participants were lower, there may be more room for improvement, allowing for even more significant changes, or larger changes in their score on each test. In order for this to happen there would need to be efforts for the program to recruit from different areas in the community. The original program was designed for community dwelling adults, but there could be less fit adults in the Reno community that could also benefit from this program. The Sanford Center could expand its advertising efforts to try to reach this portion of the population. One strategy could be to advertise in hospitals or outpatient orthopedic clinics. This could reach audiences that may not be as healthy and could benefit from a program such as Fit and Strong. It is still greatly beneficial for these already healthy older adults to learn how to safely and effectively exercise. The efforts of the program with its current implementation are greatly beneficial to the community, but it could be expanded to have an even greater impact.

Findings from Survey Data

A very interesting, yet unexpected finding was the results from the survey data. Traditionally self-reported survey data will indicate more significant changes after the intervention. In the case of the self-evaluation after the Fit and Strong program the changes were insignificant, and in a few cases, the participants indicated that they felt

less healthy and less ability to do what they wanted. The average self-indicated level of health on the pre-survey for the entire class was 3.07 on a scale of 1-5. The average score on the post-survey was 3.2. Though there was an increase, it was very small. The participants did not feel that they felt healthier after the class. Two reasons for the slight change in the average may be some of the participants were scoring themselves very highly at the beginning of the survey. Another reason was that many participants did not change their score very much after the program ended, even though the results improved from the clinical test. There are a few reasons why this may have occurred. For one, the participants may have seen how fit some of the other participants in their age range were and scored themselves lower after the program in comparison. Another possible reason may have been that the participants felt they were in good health before Fit and Strong, but then saw what they were capable of during the program, raising their own bar for a score of 4-5. Lastly, the participants that scored themselves healthy originally, could have compared themselves to the more fit members of the class, lowering their post test scores.

The survey question asking about joint symptoms had similar results to the general health question. The average score before the class was a 2.93 on a scale of 1-4 (4 being no joint pain) and the score after was a 2.87. The class rated their joint pain higher after the class ended. The reasoning for this could be similar to the previous question. The participants may have seen the new potential they have to lower their joint pain and changed their own personal threshold. Some of the participants also came from sedentary lifestyles and many had osteoarthritis. When someone with this chronic disease first begins to exercise again, there will be inevitable joint pain that comes with moving. Muscle strength was the other survey question that did not have a significant change from

the start to the end of the class. Though there was not a significant change the average did increase from 6.7 to 7.2 on a scale of 1-10. This means that although the change was not significant, overall the participants did feel that they increased in muscle strength. The insignificant results can again be attributed to the fact that the participants raised the bar for themselves after completing the class.

One must recognize the repercussions of these findings. It is important for older adults to recognize where their fitness level should be at for their age range. Knowing how active and healthy they should be could have given more reliable scores on the pre-test and made their criteria for the before and after test more comparable. If older adults believe they are healthy enough, they may not feel the need to exercise. The alternative of this point is that many older adults who are getting the amount of activity they need, may feel that they are not active enough or may be discouraged when comparing themselves to their peers. It is important that older adults are educated on how active they should be to maintain a healthy lifestyle so they can get the appropriate amount of physical activity.

The other three survey questions that were evaluated were their perceived flexibility, aerobic capacity, and pain while exercising. All three of these had significant improvements in the self-reported data after participating in the Fit and Strong program. These results may have been significant due to the fact that they were not the focus of the class. These areas of fitness are also more commonly neglected than muscle strength, so the participants could have begun with lower scores, increasing the probability for greater change.

These results can have important implications for keeping the older adults from the program motivated and motivating their peers as well. The participants now feel better after eight weeks of exercising. It is important to educate the older adults that in order to maintain or increase their newfound fitness levels, they will have to continue to exercise. It takes much less time to lose endurance and flexibility than it does to gain it. After the older adults from the program are confident in their own ability, they can then share their success with their peers to motivate other people in their community to exercise as well.

Reasons for Success

The study indicates that Fit and Strong is an effective program that has success. This success can be attributed to the program's ability to overcome barriers to exercise and utilize motivators. Fit and Strong eliminates many of the common concerns that older adult have when it comes to exercising. One of the barriers to exercise is health concerns and fear of injury (Costello et al., 2011). The Fit and Strong class offers supervision to help make sure that the participants stay safe while exercising and complete all movements properly. The coach is trained to teach the course and must be familiar with the correct form needed to complete all the required exercises. The class also offers modifications to make sure that older adults of any physical capability are able to participate. For example, for participants who did not feel safe walking outside, the instructor stayed inside and had the participants walk or dance inside for their aerobic exercise. Another modification that was offered was alternative lower extremity strength exercises. The participants that did not have a strong sense of balance were able to

complete some exercise in a seated position. These modifications can help make the participants feel safe and overcome the barriers of getting injured and health concerns.

Modifications can also help the participants overcome the barrier of feeling like they are slowing the class down and fear of embarrassment (Costello et al., 2011). If there are alternative options for the exercise, everyone can work together at their own level. In the Fit and Strong group that was evaluated, no member felt that they were too far behind. Everyone was able to work at their own ability level and received support from the group no matter what the stage.

Other barriers to exercises that were commonly stated from older adults were lack of time, lack of options, and expenses (Hardy & Grogan, 2009; Beidenweg, 2014; Costello et al., 2011). The first two concerns could be better addressed by the Reno Fit and Strong program. Fit and Strong is a long time commitment and is only offered in the morning on weekdays. To make it more accessible for older adults, the Reno community could offer other exercise programs on the weekends or in the evenings. This would also help remedy the lack of options in the area. The Fit and Strong program offers one option, but the promising results from this program indicate that having more options could be greatly beneficial. The barrier of expenses is completely relieved by this program, as it is grant funded and free for older adults.

The Fit and Strong program design also focuses on the motivators that get older adults exercising. One of the motivators is to increase health (Hardy & Grogan, 2009; Beidenweg, 2014; Costello et al., 2011). Not only does the Fit and Strong program prove to increase the fitness level of the older adults, it also gives them lessons and tips of how

to increase their health in other aspects of their life. Another motivator for the older population is the fear of disability. The results from the clinical tests indicate that the older adults' functional movements improved by the end of the class. Because they are stronger and more mobile after the class, they are less likely to have a disability based on their physical functioning.

Elders are also motivated by the presence of a coach (Costello et al., 2011). The Fit and Strong curriculum requires a coach to supervise the class. The Reno implementation of the program had a coach; but was somewhat unique in the fact that the coach was an older adult as well. There is research that proves older adults are often successful when their coach is of similar age to themselves (Costello et al., 2011). They have the attitude that the coach can better relate to how they are feeling and can be motivated by a peer exercising with them. The Reno program is a perfect example of this. The coach could better empathize with the participants than the student volunteers. She understood the correct pace and worked well with the participants in the class.

One final motivator is the social aspect of the class (Mehra et al., 2016). This benefit was evident when observing the Reno Fit and Strong class. The participants would motivate and check in on one another. They became friends with the other members of the class and would be concerned if someone missed a day. This social support helps keep the accountability of the class. It also kept the participants coming back every class as an opportunity to see their friends and catch up with the group.

Another unique addition to this program is the fact that it educates the participants on how to remain active after the program ends. The curriculum includes ideas to

overcome barriers that keep them from exercising. It also includes all of the programming that the participants would need moving forward. Not only do the participants better understand the importance of exercise, but they now know how to effectively implement it into their daily life.

Comparison to Previous Research

The Fit and Strong program has completed some analyses of their own to evaluate the effectiveness of the overall program. In the tests conducted on the program in 2004, the change in strength was not significant (Hughes et al., 2004). In the study conducted on the Reno Fit and Strong program, the results were significant. Similar tests were administered for both programs. One reason for this is that changes and improvements may have been made since the program was first implemented 15 years ago. There could also be unique things that the Reno program implements such as an older instructor or even smaller differences such as having music to motivate the class. Regardless of the reason for this improvement, it is promising for the program as a whole that the change in this study was significant.

Limitations

As with any study, there are some limitations to this research. To begin, there were only fifteen participants in this study. This is a small sample size, but the study was restricted to the members of the class, there were only 24 participants eligible to participate. Though the all people in the class were invited to be a part of the study, some were uninterested, or started the Fit and Strong class after the pre-testing was complete. Another limitation is that 14 of the 15 participants were female. Though this sample is

not indicative of the Reno population, it was representative of the Reno Fit and Strong class, as the entire class, only has three males, one who participated in the study, and two who did not complete the class, making them ineligible for the study. Another limitation is the time frame allotted for the class. Typically, exercise programs take longer than eight weeks to have significant results. The timing for the evaluation was based on the length of the program.

There were some limitations found in the protocol for the clinical tests. There are more effective clinical tests that could have been utilized to test for flexibility. For example, there is a chair sit and reach test that tests lower extremity flexibility that may have been a better indicator for this particular study. The functional reach test is still an effective measure and thoroughly researched. It would have also been ideal for the participants to have multiple trials in the pre and post-test. The time of day the participants were tested also varied. Their testing time should have been held constant. For example if they had their pre-testing conducted before the class began for that day, their post-test should not have been conducted after the class for that day. These two additions were difficult to implement due to the time constraint of the class. All testing had to be conducted within the thirty minutes before or after the class. The times also had to work in the participant's schedule. In order to accommodate all fifteen participants, time constraints were necessary.

Future Directions

There are many directions research on this program and other exercise programs could go from here. For one, more studies could be conducted on the Fit and Strong

program in different areas. The program could look into different areas where it is implemented and compare different variables such as the time the class is offered, the kind of coach they recruit, and the location of the class just to name a few. They can also look further into the cardiorespiratory effects of this exercise program.

Another interesting area the program could look into is the way they recruit. The program may be able to reach a larger scope of older adults in the community if they altered their recruitment methods. They could advertise at primary care offices for example. The Fit and Strong program could also implement some research on the effect this program has on the mental health of its participants.

As for overall health and exercise, more research can be done into older adults who are no longer community dwelling. The idea behind the Fit and Strong program is to keep older adults active to keep them independent, but adults that are already in long term care could benefit from a program like this one as well. They may be able to get out of their wheelchair, or improve their ability to walk. A program like this would also give them something to do throughout the day and could be very affordable to implement. It could also offer a social connection for these people as well.

Implications

This particular study evaluated a very specific program and had significant results that can be used to better the health of the area. Future research in this area can go in many different directions. For one, there are many promising directions research on the Fit and Strong program can take. The aerobic fitness of this class could be measured. This can be done with a step test or 6-minute walk test. Based on the results that came

from the resistance training portion of the class, there will most likely be cardiovascular improvements as well. Another opportunity is to re-evaluate the participants a few months after they complete the program. This data could help determine if the class has long term benefits, and if the participants continue exercising after the class ends.

The successful results of this program could also be utilized outside of the class and in the community as well. It would be interesting to compare the improvement of the Fit and Strong group to other exercise programs in the area. The programs could also be compared to people who just exercise on their own or are just given a program to follow. The results from this kind of study could potentially support the implementation of other exercise programs in the Reno area.

The participants in the Fit and Strong program became stronger, more flexible, and overall healthier. These results support the program's effectiveness. It is important to assess the effectiveness of programs to ensure that they are serving their intended purpose. Program evaluation can lead to improvements in areas that may have lower results. In the case of the Reno Fit and Strong program, all of the clinical tests had significant changes. These results could be used to increase funding and further promote the program to the older adults in the community.

Implementing more reliable programs like this one would increase the public health for the entire Reno area. By encouraging physical activities for older adults, their overall strength and mobility can increase. This can improve their functional movements. This capability is crucial in maintaining activities of daily living such as sitting, standing, and completing chores. If an older adult were to lose these abilities, they would lose their

independence. They would be forced to have someone supervising them at all times. This loss of independence would then lead to a lower quality of life.

Another benefit of improving the health and mobility of the older population through exercise, is decreasing the risk of falls and lower the amount of injuries and surgeries for this population. This can lead to less hospital stays and again, help older adults maintain their independence and productivity. There are large health care costs associated with both hospital stays and long term care facilities. Ultimately, allocating funds to programs such as Fit and Strong that encourage physical activity can be a great investment for the entire community. Aside from the financial cost, keeping older adults independent and productive gives them purpose and allows them to give back to the community.

The Fit and Strong program is an effective way to keep older adults active and involved in the community. This program integrates social interactions, physical activity, and education in a way that greatly benefits the older population in the Reno area. This program as well as others like it should be further implemented to better the overall health of the Reno community.

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APPENDIX

Pre and Post Survey Questions

Questions 15, 16, 31, 32, 33, and 34 were analyzed for the purposes of this study.

1. Program guide
2. Newsletter
3. Brochure
4. Flyer
5. Arthritis Foundation letter
6. Newspaper posting
7. Word of mouth – through friends or family
8. Health care provider referral
9. Instructor referral
10. Attended presentation
11. Viewed a class in progress
12. Health fair
13. Don't know
14. Other, Specify: _____

14.) Have you participated in other evidence-based programs? Select all that apply.

- | | | |
|--|-----|----|
| 1. Chronic Disease Self-Management Program (CDSMP) | Yes | No |
| 2. A Matter of Balance (aMOB) | Yes | No |
| 3. Enhance Fitness (EF) | Yes | No |
| 4. Healthy Ideas/PEARLS | Yes | No |
| 5. Enhance Wellness | Yes | No |
| 6. Arthritis Foundation Exercise Program | Yes | No |

15. How much do you weigh without shoes? _____(lbs)

16. Would you say that in general your health is:

5 Excellent ____ 4 Very Good ____ 3 Good ____ 2 Fair ____ 1 Poor ____

17. Thinking about your arthritis or joint symptoms, which of the following best describes you TODAY?

I can do everything I would like to do

I can do most things I would like to do

I can do some things I would like to do

I can do hardly anything I would like to do

Don't know/ Refused

The following questions concern the amount of pain you are currently experiencing in your hips and/or knees. For each situation, please indicate the amount of pain you

31. On a scale of 1 to 10, how confident are you that you can do exercises for flexibility and range of motion 3 to 4 times per week? A few examples of flexibility exercises include stretching exercises, Tai Chi, and yoga.

Not at all 1 2 3 4 5 6 7 8 9 10 Totally
Confident confident

32. On a scale of 1 to 10, how confident are you that you can do exercises for muscle strength 3 to 4 times per week? Examples of exercises for muscle strength include using weights, elastic exercise bands, or weight machines.

Not at all 1 2 3 4 5 6 7 8 9 10 Totally
Confident confident

33. On a scale of 1-10, how confident are you that you can do exercises such as aerobics, walking, biking or swimming – physical activity that makes your heart beat faster and makes you breathe hard or make you sweat?

Not at all 1 2 3 4 5 6 7 8 9 10 Totally
Confident confident

34. On a scale of 1 to 10, how confident are you that you can exercise without causing yourself pain or other symptoms?

Not at all 1 2 3 4 5 6 7 8 9 10 Totally
Confident confident

Physical activities are activities where you move and increase your heart rate above its resting rate, whether you do them for pleasure, work, or transportation.

Examples of physical activity intensity levels:

Description of intensity levels	Possible examples of activities for some people may include:
Light activities <ul style="list-style-type: none"> • Your heart beats slightly faster than normal • You can talk and sing 	<ul style="list-style-type: none"> • Walking leisurely • Stretching • Vacuuming or light yard work
Moderate Activities <ul style="list-style-type: none"> • Your heart beats faster than normal • You can talk but not sing 	<ul style="list-style-type: none"> • Brisk walking • Aerobics Class • Strength training • Swimming

Data

Table 11. Pre and Post Fit and Strong class scores for each participant for each clinical test.

ID	Pre SS	Post SS	Pre TUG	Post TUG	Pre FR	Post FR
A01	9	11	6.43	7.75	28	32
B02	21	18	6.49	6.54	30	43
B03	16	18	7.28	5.26	25	28
S04	12	10	12.14	9.78	11	36
C05	8	11	7.33	6.1	33	35
C06	12	12	7.82	7	21	23
C07	12	17	5.15	4.4	24	55
J08	11	12	8.72	8.95	16	17
J09	4	6	16.32	11.47	23	19
K10	14	17	6.68	5.92	15	38
P11	12	13	5.78	5.06	21	37
R12	12	17	9.43	6.56	27	31
S13	14	18	7.07	5.33	19	36
M14	24	34	6.15	6.06	30	25
G15	8	6	9.05	7.93	30	39
Average	12.6	14.67	8.12	6.91	23.53	32.93

**SS: Sit to Stand Test, TUG: Timed Up and Go Test, FR: Functional Reach Test*

Table 12. Pre Fit and Strong scores for each participant for all 6 evaluated survey questions.

Subject ID	Question 15	Question 16	Question 31	Question 32	Question 33	Question 34
A01	3	3	6	7	7	6
B02	3	4	9	10	10	10
B03	5	3	8	7	7	4
S04	4	4	9	8	9	9
C05	3	3	10	10	10	10
C06	3	2	5	3	6	4
C07	3	2	6	6	4	3
J08	3	3	6	6	8	6
J09	2	2	8	8	7	5
K10	4	3	9	9	9	9
P11	3	3	7	7	9	9
R12	2	3	6	6	5	6
S13	3	4	3	4	4	4
M14	4	4	9	9	9	6
G15	1	1	1	1	1	1
Average	3.07	2.93	6.8	6.73	7	6.13

*SS: Sit to Stand Test, TUG: Timed Up and Go Test, FR: Functional Reach Test

Table 13. Post Fit and Strong scores for each participant for all 6 evaluated survey questions.

Subject ID	Question 15	Question 16	Question 31	Question 32	Question 33	Question 34
A01	3	2	7	7	9	8
B02	3	5	10	10	10	10
B03	4	3	10	10	9	7
S04	3	3	9	8	8	8
C05	4	3	10	9	9	10
C06	4	3	7	4	8	3
C07	2	2	8	7	10	9
J08	3	3	7	7	10	7
J09	2	2	10	8	9	8
K10	5	3	7	7	10	10
P11	3	3	9	7	9	8
R12	3	3	9	8	9	8
S13	3	3	6	7	7	6
M14	4	3	9	7	8	7
G15	2	2	7	2	6	1
Average	3.2	2.87	8.33	7.2	8.73	7.33

*SS: Sit to Stand Test, TUG: Timed Up and Go Test, FR: Functional Reach Test