Fitness that Fits: Evaluating the Effectiveness of an Individualized, Choice-Based, Matching Tool for Older Adults

A thesis presented to the
School of Kinesiology Lakehead University
In partial fulfillment of the requirements for the
Master of Science Degree in Kinesiology
with a Specialization in Gerontology

By

Justin J. Lang

Acknowledgements

I want to thank Dr. Joey Farrell for guiding and challenging me to become a better researcher and student. I want to acknowledge Dr. Ian Newhouse for his confidence in me and his readily available support. I want to thank Mrs. Tracey Larocque for initiating the idea that constitutes this thesis, and for helping me through the first steps of this project. I would like to recognize Mr. Glen Paterson for providing his knowledge and expertise. I would also like to thank Mrs. Anthea Kyle for her patience in helping me develop into a better writer.

Dedication

Dedicated to the memory of both my grandmothers:

Colette Lemay (December 21st, 1936 – March 25th, 2012)

&

Barbara Nina Lang (March 30th, 1931 – June 9th, 2013)

Abstract

Background/Objective: A positive relationship exists between exercise and improved overall health; this is especially important for older adults since they have been identified as the most sedentary segment of the North American population. Communities may provide structured exercise classes for this population, but choosing a class that is appropriate for an individual's fitness level can be a daunting task. The use of an individualized, choice-based, matching tool for older adults could allow individuals to select exercise classes that are appropriate for their fitness level. Thus, members of Lakehead University research team developed the Fitness That Fits (FTF) tool. Through the FTF tool development 28 exercise classes were evaluated and assigned an FTF level, which represents four different intensity levels. This tool is designed to match older adults with exercise classes based on the results of a functional fitness assessment, the Senior Fitness Test (SFT). With SFT results, participants receive an FTF level similar to the exercise class FTF level. Participants are then able to choose an appropriate class that may pertain to their interest. The purpose of this study was twofold. First, the purpose was to evaluate the effectiveness of the FTF tool in assessing whether a participant FTF level matched the level assigned to his/her respective exercise class. Second, the purpose of this study was also to gain a better understand of the underlying causes of any mismatches. **Method:** One male and 59 female participants (55+ years old) were recruited from a representative sample of 18 exercise classes that were previously assessed through the FTF tool development. Participants completed the SFT, and results were analyzed to determine if the participant FTF level matched the FTF level of their self-selected exercise class. Participants also completed a survey to explore whether they believed their exercise

class FTF level was appropriately assigned, potential factors for participant FTF level and class FTF level mismatch, and participants' views on the future applicability of the Fitness that Fits tool. **Results:** Thirty percent of participants FTF level matched their self-selected exercise class FTF level. Three factors were identified to explain possible mismatched participants: the participant selected a class that was not appropriate to his/her fitness level, the class fitness level may not have been assigned appropriately, or the functional fitness assessment did not assign participants an accurate fitness level. **Conclusion:** In total, 30% of participants matched their self-selected exercise class FTF level. This study was a preliminary descriptive project that was the first of its kind to use a SFT to determine a composite functional fitness score. It was also the first to assign exercise class intensity levels based on functional fitness. The majority of participants indicated that the Fitness that Fits tool may be especially useful to help beginners to select a suitable exercise class, highlighting an area for future research.

Table of Contents

List of Tables

List of Figures

Introduction

Participation in physical activity throughout the life course is vital to maintain a healthy lifestyle; this is especially true for older adults (Lees, Clark, Nigg, & Newman, 2005). In 2010, nearly 4.8 million Canadians were 65 years of age or older, representing 14% of the Canadian population (Canadian Institute of Health Information [CIHI], 2011). This figure is expected to rise substantially: by 2036, 25% of Canadians will have reached 65 years of age, representing nearly 10.4 million people (CIHI, 2011). The Thunder Bay community represents the fourth oldest in Canada, with approximately 15% of the population being 65 years and older (Statistics Canada, 2006), a figure that is projected to increase to 27% within the next 20 years (Ontario Local Health Integration Network [LHIN], 2011). Although deteriorating physical function may be unavoidable as people age, the presence of some chronic conditions can result from poor lifestyle and sedentary behaviour.

This fastest growing segment of the Canadian population is also characterized as being the most sedentary and unhealthy (CIHI, 2011). With the prevalence of chronic conditions that increase with age, by 65, more than four out of five older adults living at home will suffer from one or more chronic conditions (Health Canada, 2002). Thunder Bay's aging population reflects a higher percentage of individuals with chronic conditions. Compared to the rest of Canada, the prevalence of chronic conditions is five to eight percent greater (LHIN, 2011). Of these, the most commonly reported conditions include arthritis and rheumatism, high blood pressure, allergies, back problems, heart problems, and diabetes (Health Canada, 2002). For all aforementioned chronic conditions, physical activity and exercise are known to relieve many of symptoms.

For some older adults selecting a new exercise class can be a daunting task. With a variety of classes to choose from, knowing which class is appropriate to one's level of fitness is not often clear. Matching individuals with an appropriate exercise class based on fitness level would be valuable for exercise prescription within the older adult population. Development and utilization of an individualized matching tool would be beneficial for this diverse population. Ensuring that older adults are provided with the best possible scenario to succeed within an appropriately matched exercise class allows for the multiple benefits of exercise to be experienced.

Benefits of Exercise

The Canadian Society of Exercise Physiology (CSEP) recommends that to achieve health benefits, adults aged 65 years and older should perform 150 minutes of moderate to vigorous aerobic exercise per week, in segments of 10 or more minutes (2012). It is also recommended that older adults add muscle and bone strengthening activities at least two days per week. Health Canada (2002) indicates that through regular and moderate exercise, individuals can cut the decline of aging in half, while reducing the risk by 50% of most chronic diseases, such as cardiovascular disease, type II diabetes, obesity, osteoporosis, and metabolic syndrome. Furthermore, some chronic conditions, such as obesity and osteoporosis can also cause mobility issues, which might be associated with future falls.

It is estimated that one in three adults aged 65 and older will sustain a fall at least once each year, and 20% of whom will experience a serious injury (Scott, Wagar, & Elliot, 2010). For those with mobility issues, exercise is an excellent form of therapy to improve balance and decrease the chance of sustaining a fall. Exercise can preserve

the fitness level required for activities of daily living, resulting in an increase of independence. These benefits are not exclusive to those who are healthy. Often, those who are the most sedentary experience the most advantages through regular moderate exercise, suggesting that it is never too late to experience the benefits of exercise (Schutzer & Graves, 2004). Furthermore, the majority of older adults do not engage in sufficient exercise to maintain functional fitness.

Maintaining Functional Fitness. Functional fitness can be defined as "the ability to perform activities of daily living safely and independently without undue fatigue" (Rikli & Jones, 1999, p. 133). A "normal level" of functional fitness is required to perform activities of daily living, such as getting groceries, cleaning the house, cooking, doing yard work, and gardening (Rikli & Jones, 2001). Functional fitness can be broken down into five physical parameters: muscular strength, muscular endurance, aerobic endurance, flexibility, and motor ability (power, speed/agility, and balance). All activities of daily living require some degree of each of the five physical parameters, but with low levels in each of these physical parameters, individuals are considered "at risk for loss of functional mobility" (Rikli & Jones, 2001). It is essential to maintain high levels of functional fitness to remain independent. To maintain functional fitness an individual can select a well-rounded exercise program that addresses all the physical parameters of functional fitness (Chodzko-Zajko, 2013). Most exercise programs are well-rounded and include aerobic exercise at a moderate to vigorous intensity level, resistance exercise, and balance training; nonetheless, a particular exercise program may not be appropriate for every individual. Since functional fitness differs from individual to individual this makes it important to select an exercise program within an individual's

functional fitness level. Therefore, when prescribing an exercise program to an older adult population, it is important to take an individualized approach.

Prescribing the Right Exercise Program

The older adult population is considered a heterogeneous cohort, characterized by a vast age range (65 years and older), one or multiple diagnosed chronic conditions, interactions between multiple chronic conditions, and the possibility of mobility issues. With a heterogeneous cohort a “one-size fits all” approach to exercise prescription does not work (Rasinaho, Hirvensalo, Leinonen, Lintunen, & Rantanen, 2006). An effective approach to prescribing exercise is through an individualized model (Rasinaho et al., 2006), where older adults can be matched with an appropriate exercise program, providing the best chance to have a positive exercise experience. Through creating an individualized model that enables a choice-based component, older adults can choose an appropriate class and therefore exercise comfortably within their functional fitness level, developing positive exercise experiences that ensure short-term success. In addition, this individualized model to exercise prescription, which would include a matching component with available exercise classes can promote the development of group cohesion, a dynamic process that is reflected in the tendency of a group to stick together and provide support while striving towards common pursuits and goals (Avers, 2010).

To influence group cohesion within an exercise class, participants must share similar goals and similar functional fitness levels (Avers, 2010). A class of individuals who share a similar functional fitness level also can experience exercise at the same intensity level, initiating meaningful human interactions and positive experiences

between exercisers. Among older adults, it is well established that positive experiences and human interaction are powerful motivators to exercise (Rasinaho et al., 2006), but for this to occur there is a need to promote appropriate exercise for the older adult population. An individualized model that provides older adults with the means to choose an appropriate exercise class can have a positive influence on the social aspect of exercise, while decreasing the influence of any barriers to exercise.

Barriers to Exercise. While increasing exercise motivation, an individualized model that provides older adults with the opportunity to select an appropriate exercise class can also address some of the barriers to exercise. Schutzer and Graves (2004) reported that 87% of older adults experienced at least one barrier to exercise participation. Through an individualized approach barriers such as lack of knowledge and health conditions can be addressed.

Lack of knowledge. Studies have identified that lack of knowledge may be a barrier to exercise for older adults (Rasinaho et al., 2006). Some older adults may not know where to exercise, or how to gather the knowledge necessary to participate in an exercise class (Moschny, Platen, KlaaBen-Mielke, Trampisch, & Hinrichs, 2011). By providing older adults with the opportunity to select an existing exercise program that is within their functional fitness level, an opportunity can be provided to increase knowledge. Through an individualized model to aid in exercise class selection, individuals might gain a general understanding of their fitness level and what they need to improve. Older adults may also gain further knowledge of the classes within the community that can accommodate their individual fitness levels. Increased knowledge

resulting in improved awareness of functional fitness is especially important for those who have health problems and/or minimal exercise experience.

Health. Schutzer and Graves (2004) indicate that health problems are the leading barrier to exercise for older adults, with common health related problems being reported as arthritis, knee or back problems, and/or functional limitations (Moschny et al., 2011). Often, the concept of exercising while afflicted with one or multiple chronic conditions can represent a major barrier for some older adults; however, none of these conditions constitutes contraindications to exercise. Exercise is strongly recommended for those with chronic conditions and functional limitations (Moschny et al., 2011) since it can delay the progression of most conditions while decreasing the associated pain. Many of these individuals may not know which exercise class is best for them. For those with health problems and concerns about exercising, finding a class that is appropriate for their functional fitness level may serve as a motivator to exercise.

Motivators to Exercise. In addition to addressing barriers to exercise, a tool that enables older adult participation in exercise classes should also address the motivators to exercise. Providing older adults with the opportunity to experience motivators may help with their exercise pursuit. Rhodes and colleagues (1999) report that over 50% of older adults will drop out of a newly adopted exercise routine within the first six to twelve months. However, by providing an opportunity for older adults to increase their exercise self-efficacy, while maintaining a choice-based model and identifying progress over time, adherence to an exercise program may improve.

Self-Efficacy. Low self-efficacy or low perceived capability is often a problem for older adults who have not had many positive experiences with exercise. Low self-

efficacy with exercise can be defined as the belief that one cannot perform an activity (Lees et al., 2005). Those with low self-efficacy may feel as though they would not be able to keep up, or that they might hinder the progress of an already established exercise class, which may intimidate those looking to join an exercise class (Costello, Kafchinski, Vrazel, & Sullivan, 2011). It has also been established that those with low perceived ability are often more likely to have a fear of falling during an exercise class (Lees et al., 2005). Although this can be a strong barrier to exercise, it is relatively easy for older adults to overcome. A positive contributor to self-efficacy can occur with only a short duration of participation in exercise that is within a intensity level appropriate for the individual, providing short-term success (Clark, 1999; Costello et al., 2011). Once the hurdle of overcoming low self-efficacy has been achieved, this barrier to exercise can evolve into a powerful motivator, improving adherence to an exercise program.

Exercise Adherence. Having older adults maintain a selected exercise program for an extended period of time is vital for experiencing all the benefits of exercise. Exercise adherence can be improved through four main factors: addressing barriers (Rhodes, 1999), improving self-efficacy (Clark, 1999; McAuley, 1992; Rhodes, 1999), perceiving choice (Rhodes, 1999), and identifying progress (Chao, Foy, & Farmer, 2000; McAuley, 1992). Older adults who are able to address some of the barriers to exercise such as health concerns and lack of knowledge can improve exercise adherence (Rhodes, 1999). For those who experience some of the identified barriers, selection of an appropriate exercise class may provide positive exercise experiences; in turn, this may result in an increase in self-efficacy, which promotes adherence to exercise (Clark, 1999; Rhodes, 1999). Perceived control can be

established by aiding older adults with the exercise class selection process, allowing for improved adherence; this is possible through an individualized choice based model, where older adults have the ability to select a class that pertains to their interest, while also being appropriate to their exercise ability (Rhodes, 1999). It is also important to be able to recognize continued improvement in physical fitness as a result of exercise participation. At times, recognizing improvements can be difficult as they occur gradually, but continued exercise can add up to large improvements over the course of several months. When a participant can no longer identify progress from his/her exercise regimen, he/she can lose interest in continuing with the activity. A tool that can assess progression in physical ability can also help detect if an individual's gains in ability have ceased to progress. Kramer and Ratamess (2004) state, that to maintain physical progress through exercise, variations in exercise routine have to occur. When assessing progress, any decline may indicate that a participant should select a different exercise regimen so that physical progression continues. To develop exercise adherence, older adults can use a tool that measures improvements (Chao et al., 2000); for example, an assessment tool where older adults can measure their functional fitness monthly and compare their results provides an objective measurement of physical improvement, allowing for identified progress.

Current Exercise Prescription Guidelines

To assist older adults in their selection of an exercise class, the American College of Sports Medicine (ACSM) provides pre-participation screening guidelines for risk stratification. The guidelines proposed by ACSM are intended to optimize safety by identifying those with risk of experiencing adverse cardiovascular events during

exercise (American College of Sports Medicine [ACSM], 2009). The ACSM professional guidelines suggest that anyone over the age of 40 who plans on initiating a moderate to vigorous exercise program should start with pre-participation screening (Resnick, Ory, Coday, & Riebe, 2005). In addition to safety, results from treadmill stress testing are often used for exercise prescription purposes (ACSM, 2009). A treadmill stress test is a supervised medical test to examine the heart's response to physical exertion, often used to establish a safe target heart rate for exercise (Chaitman, 2011). With the help of an exercise specialist, treadmill stress test results not only help guide participants toward an appropriate exercise program, but the results can also help with developing an individualized exercise program. The information from treadmill stress testing is currently the gold standard for effective exercise prescription. Figure 1 illustrates the ACSM risk stratification process.

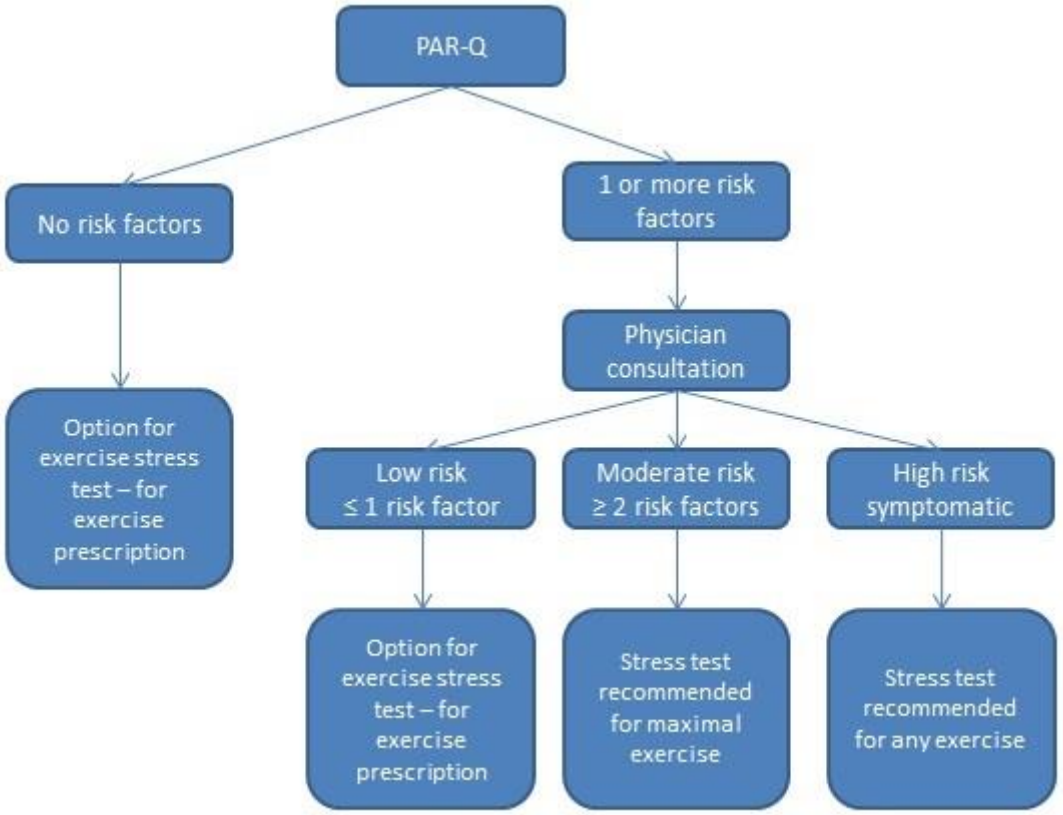

Figure 1. ACSMs risk stratification for older adult pre-participation screening. A Pre-Participation Questionnaire (PAR-Q) identifies cardiovascular risk factors, which if present results in a physician consultation for further risk stratification into three separate categories: low risk (asymptomatic), moderate risk (asymptomatic less than 2 symptoms), and high risk (known cardiovascular disease).

Shortcomings of the Exercise Prescription Guidelines. In recent years, concerns have arisen about whether ACSM's current pre-participation screening guidelines are the most effective method of screening individuals prior to their engaging in moderate to vigorous exercise. In addition, the ACSM guidelines' effectiveness in assisting with exercise prescription for the older adult population has also been questioned. Although the current guidelines represent good intentions to enhance health and safety, the screening process can represent a burden or barrier for fit older

adults looking to initiate an exercise program (Resnick et al., 2005). The extent of frequent false positive test results may suggest that exercise stress testing has a limited predictive value in isolating those who are at serious risk of succumbing to a cardiovascular event while exercising (Ory et al., 2005). For adults who are 55 years or older and/or who have some form of chronic condition, the pre-participation screening process would initiate a physician consultation and exercise stress testing (Ory et al., 2005). Also, many older adults exhibit coronary artery narrowing common with the aging process, which may result in a positive stress test (Nied& Franklin, 2002), although the individuals would still be safe to exercise at a moderate intensity.

In addition, exercise stress testing represents a major shortcoming of the current pre-participation screening guidelines because it fails to address musculoskeletal injuries as a screening concern. Musculoskeletal injuries within the older adult population are common, and can lead to adverse events such as muscle strains (Ory et al., 2005), which are a serious concern as they can deter individuals from continued participation in exercise (Resnick, Ory, Coday, & Riebe, 2008). Resnick et al. (2008) have suggested that there is a need to enhance health and safety for those looking to initiate a moderate to vigorous intensity exercise program, especially if they were previously sedentary. Nonetheless, the ideal guideline to enhance health and safety remains a controversy. There is no present need to replace the existing screening guidelines; however, there is a recognized need for more comprehensiveness within the screening process: to “match the participant with an appropriate exercise program so that musculoskeletal trauma [is] avoided; educate the older individual’s health care provider about the recommended exercise program; and to motivate the

participant by challenging them to increase their performance when compared to baseline measures recorded during the screening process" (Resnick et al., 2008, p.26).

A Shift in the Exercise Selection Guidelines. In an attempt to understand the perspective of older adults who have experience with the current pre-participation guidelines, Resnick and colleagues (2005) conducted a focus group study. The study was designed to identify if screening was beneficial to ensure that exercise was safe, but the actual findings indicated a different outcome unrelated to safety. The study's participants indicated that screening was a confidence builder before participating in exercise because it provided older adults with a ways to understand their physical capability, providing them with the confidence that their selected program was right for them. On the contrary, the study indicated that older adults who were already fit and active felt the screening was unnecessary and posed a barrier to exercise. Through the focus group feedback, Resnick et al. (2005) was able to establish that screening should mainly be provided as an "individualized evaluation of exercisers abilities and would be the basis for the prescription of an [exercise] program that would be safe and beneficial" (p. 25). Recommendations pointed toward future exercise prescription and screening that would help match older adults with appropriate exercise classes to help optimize health.

Extending from the 2005 study, Resnick and colleagues (2008) conducted another focus group study with the intention of finding out how clinicians and researchers felt about the current pre-participation screening guidelines. Much like the older adult focus group, clinicians and researchers also believed that screening helped improve the confidence level of individuals before they participated in an exercise

program. However, it was also identified that screening may represent a barrier to exercise. With the documented inaccuracy of exercise stress testing, clinicians and researchers were concerned that false positive test results may cause harm to the participants' psychological and physical wellbeing. Clinicians and researchers recognized that screening should be a way to find out more about the functional ability of the participant so that an appropriate exercise program could be prescribed. It was also identified that screening can be used as a baseline measurement, allowing for older adults to monitor their progress over time.

The consensus throughout the literature is that pre-participation screening should include a functional fitness assessment (Chodzko-Zajko & Resnick, 2004; Morey & Sullivan, 2003; Ory et al., 2005). This assessment could be used to improve participants' understanding of how fit they are when compared to normative data. This information would be useful to prescribe a tailored exercise regimen aimed at improving the functional weaknesses of the participant (Chodzko-Zajko & Resnick, 2004). Likewise, the assessment results could also inform a participant of what type of activities should be avoided (e.g., high impact) (Ory et al., 2005). Using a simple functional fitness assessment may also lend itself to self-assessment (Morey & Sullivan, 2003). Older adults can have access to the assessment instructions and normative data. With their individualized results they can be directed towards existing community resources that would help them exercise safely and within their fitness level, which would be a cost effective way to prescribe safe exercise within the community setting.

In addition to the possibility of self-assessment, using a functional fitness assessment may lend itself to ongoing assessment (Ory et al., 2005). When starting a

program, older adults might be directed to perform low-intensity exercise, but as they improve their fitness level, further screening might challenge them to increase their intensity level, and ongoing assessment can guide these changes. Recurrent screening can also serve as a motivator providing those with ongoing assessment an opportunity to visualize their fitness improvements (Ory et al., 2005).

Although it is not the intention to have functional fitness assessments replace the existing pre-participation screening guidelines, there is a recognized need for including an optional functional fitness assessment within the exercise prescription process (Morey & Sullivan, 2003). Functional fitness assessment would not necessarily be a mandatory component of screening; however, if an older adult is interested in performing the assessment the information gathered can be valuable for meaningful exercise prescription. Ory and colleagues (2005) suggest that "using screening as a tool to facilitate participation in appropriate exercise programs rather than as a potential barrier to exercise is important for recruiting and retaining participants in health promotion programs that can improve the health of our communities and prevent disease and disability for all" (p. 26).

Utilizing Existing Community Exercise Classes.

Morey and Sullivan (2003) have identified that clinicians need to understand resources offered by the community so they can make proper referrals to exercise programs. The benefits of referring older adults to existing community exercise classes that are appropriate for their functional fitness can have a positive influence on health. To date, only the Community Healthy Activities Model Program for Seniors (CHAMPS) has actively incorporated community exercise programs. The CHAMPS model is

described as a choice-based, individually tailored, lifestyle exercise promotion program that uses existing resources (group exercise classes) within the community. CHAMPS incorporates a pre-exercise regimen that includes a preliminary information meeting for all participants, one-on-one assistance in selecting exercise classes, and a directory with detailed descriptions of exercise classes (Sepsis et al., 1995). During the program, CHAMPS encouraged participants through self-report activity logs, monthly group meetings, monthly newsletters, staff telephone calls to encourage participants, and small prize incentives for attendance (Stewart, Sepsis, King, McLellan, & Ritter, 1997). In addition, all components of the program are designed to address the many barriers to exercise for older adults.

The project included three separate studies all evaluating the effectiveness of the CHAMPS program (Stewart et al., 1997; Stewart et al., 2001; Stewart et al., 2006). CHAMPS 1 was a quasi-experimental design where one congregate housing facility received the CHAMPS program as an intervention and a second congregate housing facility was selected as a control. The experiment was conducted over a six month period. Dependent measures included self-report activity logs (frequency of class attendance), pre and post questionnaires to measure caloric expenditure and frequency, and health-related quality-of-life. Results indicated a significantly greater frequency of classes attended for the intervention group when compared with the control group. The intervention group also demonstrated a significant increase in self-esteem relative to the control group. Of the intervention group who originally adopted a new exercise regimen, 60% maintained their newly adopted exercise throughout the six month intervention. During a five month follow-up, when the intervention was no longer

offered, the 60% of exercisers that maintained their exercise level dropped to 35% (Stewart et al., 1997).

CHAMPS 2 attempted to test the effectiveness of the CHAMPS program through a one year randomized control design. The study included 173 older adult participants with a variety of health problems. Results were very similar to CHAMPS 1, demonstrating the effectiveness of the program at influencing a significant increase in exercise participation as compared with the control (Stewart et al., 2001). CHAMPS 3 was the last project of a three part series that provided an attempt at disseminating the CHAMPS program to three different communities within the San Francisco Bay area. The project highlights significant barriers in implementing the program and how they were successfully overcome (Stewart et al., 2006).

Although the CHAMPS program displays an innovative idea for implementing an inclusive, choice-based exercise promotion program that uses existing community resources, a major limitation was identified. Participants were encouraged to select their own exercise class that was “suited to their interests, [self-perceived] abilities, income, and transportation resources” (Stewart et al., 1997, p. 354). Participants were instructed to start slowly and work their way up to a target frequency of three to five times per week, while attending a variety of classes in order to develop a balanced program of endurance, strength training, flexibility, balance, and coordination. Trained staff members were available to assist participants with selecting classes (Stewart et al., 1997). This model, although idealistic, may lend itself to several problems. CHAMPS did not offer a functional fitness assessment to help participants understand their physical ability, and with limited exercise experience, it may be difficult for participants to develop

an accurate awareness of their self-perceived ability in order to select a suitable exercise class. Furthermore, the CHAMPS program did not measure whether a participant selected a well-balanced program that suited all needs. If a tool was developed to aid older adults in selecting functionally appropriate classes, while maintaining a choice-based option, a program such as CHAMPS may benefit through improved participation within the older adult community.

The Fitness that Fits Tool

The Fitness that Fits (FTF) tool was developed through a previous project (Larocque, Lang, Farrell, Newhouse, & Paterson, 2013) conducted at Lakehead University as a means to help older adults select existing exercise classes that matched their functional fitness level. To begin the development of the FTF tool, researchers developed exercise class descriptions. To do this, researchers met with fitness coordinators from two facilities in Thunder Bay that cater to exercise programming for older adults. Each fitness coordinator provided the researcher with a list of exercise classes at his/her facility that were geared toward accommodating older adults, as well as the name and contact information for the fitness instructors who taught the classes. Each fitness instructor was contacted by the research team in order to set up a meeting/interview time. During the meeting/interview, the fitness instructor completed a survey that gathered information on the instructors' perception of functional ability necessary for older adults to comfortably participate in their exercise classes. Once the survey was completed, the researcher proceeded to interview the fitness instructors to obtain additional descriptors that represented their exercise classes.

With the collected data, the research team developed the FTF tool (see Appendix A). The FTF tool provides detailed descriptions of four different class categories, representing different exercise class intensity levels. The intensity levels are categorized from A to D. An AFTF level represents classes that required a high level of functional fitness to comfortably participate, whereas D FTF level classes accommodated a low level of functional fitness.

Using the FTF tool, along with the data collected from the meeting/interviews and survey responses from each fitness instructor, the research team assigned a FTF level to each class (see Appendix A). A total of 28 classes were categorized into FTF levels A, B, C, or D. Of the 28 classes, two were categorized as FTF level A, ten were categorized as FTF level B, ten were categorized as FTF level C, and the remaining six classes were categorized as FTF level D. In addition, class descriptors were condensed and added to the Class List (see Appendix A).

Once the FTF tool was developed by the research team and each exercise class received an FTF level, member-checking was carried out to validate the qualitative data that comprised the FTF tool. The FTF tool and Class List were sent to all instructors to evaluate its accuracy, in terms of whether their exercise class descriptors and the research team's designated FTF level intersected with what they had expected. All exercise instructors responded with their approval.

When developing the FTF tool, the researchers had intended the tool to be used along with a functional fitness assessment. The functional fitness assessment that was selected, based on a systematic review of literature conducted by the author of this thesis (see Appendix D), is the Senior Fitness Test (SFT; Rikli & Jones, 1999). The SFT

is a quick and simple assessment that does not require a trained professional to administer. The assessment consists of six test components: (1) the arm curl test, (2) the chair stand test, (3) two minute step test, (4) chair reach test, (5) back scratch test, and (6) the eight-foot up-and-go. The SFT provides detailed instructions on assessment protocol (see Appendix D); however, the assessment protocol for the two-minute step test may be difficult to administer simultaneously on a large group of participants.

The two-minute step test requires participants to step in place for two minutes while the researcher counts every second step to determine the participant's score. When assessing a large group of participants with minimal available researchers, counting steps is not a viable option; in this case a pedometer can be used to count steps. Pedometers have been proven as reliable instruments for counting steps in an older adult population (Stryker, Duncan, Chaumeton, Duncan, & Toobert, 2007), and as such were used as a practical option for counting steps during the administration of the two-minute step test.

Through assessing older adult participants with the SFT each individual received a participant FTF level, similar to the FTF level assigned to each of the exercise classes. Results from each of the six tests were scored and categorized into levels A, B, C, or D (see Appendix A). Categories were established using the 60 to 64 year old normative data performance charts (Rikli & Jones, 2001). The A FTF level represented "above average" performance, the B FTF level represented the greater half of the "normal range", the C FTF level represented the lower half of the "normal range", and the D FTF level represented the "below average" performance level. Once scores on all six test components were assessed and categorized they were combined and

averaged in order to determine the participant FTF level, which represented his/her composite functional fitness score. Furthermore, the 60 to 64 age category was selected because it represented the youngest age cohort in the performance charts, and exercise classes do not discriminate based on age. Therefore, if an 80 year old, for example, can exercise at the same functional level as a 60 year old, then both could be matched with the same exercise class that accommodates their functional fitness level.

The FTF tool was developed to meet the need for an individualized, choice-based, matching tool for exercise prescription within an older adult population. It is the first of its kind, to the knowledge of the researcher, to use a composite functional fitness score, based on SFT assessments, as a means to match older adults with available exercise classes. The SFT is a popular assessment of functional fitness and it has been proven as a reliable and valid instrument.

Reliability and Validity of the Senior Fitness Test. The SFT was the selected tool to assess functional fitness within this study. Rikli and Jones (1999) developed the SFT, and through their reviewed literature and conducted research studies, the SFT has shown to be both a reliable and valid measure on functional fitness within the older adult population.

Reliability. The American Psychological Association (1985) indicates that a reliable test is free of measurement error and produces dependable and consistent scores from one trial to the next. While validity is the most important characteristic of a fitness test, reliability must be established before a test can be valid (Morrow, 2002). Reliability is represented by the obtained score of a measurement, which is further broken down into two portions: the true portion and the error portion. The true portion

reflects a perfectly accurate score whereas the error portion represents inaccuracies such as measurement error, bias, and random error (Morrow, 2002). To have a reliable test, an obtained score must consist of a minimal error portion, and the true portion must represent the bulk of the score (Rikli & Jones, 2001). When assessing a measurement tool, such as the SFT, the best way to establish reliability is through test-retest.

Test-retest reliability is carried out when a group of individuals are assessed using a measurement tool, the same group is then retested on a different day using the same tool. The correlation between the two tests represents consistency of the measurement tool; if the correlation is high, greater than 0.80, then the tool is said to be reliable in producing consistent scores (Morrow, 2002;Rikli& Jones, 2001).

To assess reliability of the SFT protocol, Rikli and Jones (1999) conducted test-retest study for each of the six fitness assessments components (chair stand test, arm curl test, two-minute step test, chair sit-and-reach test, back scratch test, and eight-foot-up-and-go test). Participants included 82 men and women (mean age of 78.8 years) who lived independently within a retirement housing complex. Results from the study indicated that the fitness assessment components were reliable, as the correlations were all above 0.80. Once the SFT was identified as a reliable, the researchers began to evaluate the validity of the instrument.

Validity. Validity can be described as the degree to which a measure accurately represents what it is intended to measure (Mahar & Rowe, 2002). In order for a measure to be valid, it must first be established as reliable (Morrow, 2002). Validity is encompassed by three components: content-related, criterion-related, and construct-

related. Content-related validity reflects the logical interpretation of the truthfulness of the measure, which is often assessed by expert opinion on whether the measure assesses what it is intended to measure (Rikli & Jones, 2002). Criterion-related validity is established by comparing the measure against the gold standard, a high correlation between the two would suggest a high degree of validity (Mahar & Rowe, 2002). Construct-related validity represents the degree to which the measure represents the theoretical concept that it intends to measure and is established through concurrent evidence of multiple studies (Mahar & Rowe, 2002).

To assess the different types of validity for each of the SFT assessment components (chair stand test, arm curl test, two-minute step test, chair sit-and-reach test, back scratch test, eight-foot up-and-go test) literature was reviewed to uncover existing support of validity (Rikli & Jones, 2002). For each assessment, content-related validity was established through a local scientific advisory panel that included exercise specialists in southern California, and a national panel comprised of noted researchers from the gerontology and exercise science field (Rikli & Jones, 1999). The advisory panels supported the selection of each assessment as a measure of functional fitness. Criterion-related validity was established through a ≥ 70 correlation with a gold standard for each test: 1RM leg press (chair stand test), combined 1RM chest press, biceps, and upper back (arm curl test), 1-mile walk time (2-minute step test), goniometer-measured hamstring flexibility (chair sit-and-reach test), no criterion available (back scratch and 8-ft up-and-go test) (Rikli & Jones, 1999). Construct-related validity was established for each assessment through its ability to discriminate from person to person. For example,

a known group of sedentary individuals should perform lower than a group of active individuals, providing a “discriminant” measure.

Evaluation of the Fitness that Fits Tool. Although the SFT is a proven reliable and valid measure of functional fitness within the older adult population (Rikli & Jones, 2002), it has never been used as a method of determining a composite functional fitness score. The SFT was developed as a rehabilitation tool to identify functional weaknesses, providing insight as to which aspect of functional fitness an individual may need to improve. In exercise prescription and exercise program selection, classes do not discriminate on specific aspects of functional fitness; in fact, classes often provide a well-rounded approach to exercise allowing individuals to improve fitness as a whole. Using a functional fitness assessment such as the SFT could lead to exercise prescription that is based on a combination of all scores to allow for a single composite measure of functional fitness, which can be used to match individuals with available exercise classes. As this method for using the SFT has not previously been attempted, the established reliability and validity of the test may be compromised. For this reason, further reliability and validity evidence has to be established in support of using the SFT in this manner.

Through this study, the main focus was to establish an individualized, choice-based, matching tool for exercise prescription for older adults (the FTF tool). The individualized component was provided through the functional fitness assessments, and based on fitness results, participants were provided with classes that matched their fitness level. Participants were then able to choose a class that may interest them, establishing a choice-based component. The FTF tool as a whole is a new approach to

exercise prescription that would benefit an older adult population although, as with any tool, the FTF requires additional testing to be proven reliable and valid. As Mahar and Rowe (2002) indicated, a tool first must be proven reliable through correlations of a replication study; next, validity is established through a process of accumulating evidence to demonstrate that inferences of scores are meaningful and appropriate.

As a way to determine the effectiveness of a new fitness tool, an evaluation study can take place (Thompson, Kegler, & Holtgrave, 2006) through assessing the tool's matching capability. To carry out this objective, the tool must be able to match participant composite FTF levels with existing community exercise class FTF levels. The logical first step in this project would be to evaluate exercisers within community classes to see what composite FTF level they are at, and whether they matched their self-selected class FTF level. A subjective measure of whether the tool discriminates those who matched from those who are unmatched would be a suitable preliminary evaluation of the FTF tool.

Purpose

The purpose of this study was twofold. First, the purpose was to evaluate the effectiveness of the Fitness That Fits tool in assessing whether a participant's FTF level matched the level assigned to his/her respective exercise class. Second, the purpose of this study was also to determine the underlying causes of any mismatches.

Method

Participant Recruitment

Individuals who were 55 years and older and participated in any of the 28 classes included in the development of the FTF tool were eligible to participate in the study. The 28 exercise classes combined had approximately 400 exercisers, of which 60 individuals chose to participate in this study (59 female and 1 male) .At the time of the study, 16 of the 28 exercise classes had stopped for the summer break. To recruit participants from these classes, facility staff (for confidentiality reasons) mailed out letters (see Appendix B) to those who had participated within the past six months, in one of the 16 exercise classes, asking them to take part in the study. The letter contained five separate testing dates for those who were interested in participating; participants were asked to attend one testing date with no need for confirmation.

During the development of the FTF tool all exercise class instructors consented to the researcher's participation within his/her exercise class. For the 12 classes that were still being offered at the time of data collection, an email was sent to the class instructors notifying them that the student researcher was to attend the following class to collect data. The email also provided the instructors with a scripted paragraph which they were asked to read to all class participants to inform them that the student researcher would be attending their next class, and requesting class participants to participate within a testing session following the class. All potential participants were informed that participation would take approximately one hour (see Appendix B).The student researcher participated in each of the 12 exercise classes. Following the

exercise class the student researcher introduced himself and the FTF tool to the class participants. Afterwards, all interested participants were invited to the testing session.

In total, the combination of the mailed letters and the in-class recruitment provided a representation of a total of 18 exercise classes from the original 28 classes surveyed. Testing procedures were identical, apart from the warm-up duration, for both recruitment methods. Regardless of recruitment method, participants were invited to complete a brief two-part survey and to perform the SFT (Rikli & Jones, 1999).

Instrumentation

Instrumentation for the project included: a FTF survey, the FTF tool, and the SFT.

Fitness that Fits Survey. The two-part FTF survey consisted of a demographic section, eleven Likert-type, two dichotomous, and five open ended questions. When appropriate, additional space was provided for participants to expand on a response. The purpose of the survey was threefold: to determine whether the participant believed that he/she has chosen an appropriate class, in terms of his/her own perceived functional fitness level; whether he/she believed that the FTF level for his/her class matched his/her perception of the class intensity level; and whether he/she believed that the FTF tool would be useful for helping older adults select an appropriate exercise class.

Fitness that Fits Tool. The FTF tool was used to assign intensity levels for 28 existing community exercise classes offered through the Canada Games Complex and the 55 Plus Centre. Intensity levels ranged from A level (advanced class) to D level

(beginner class). Participants were provided with their pre-determined class FTF level as this information was needed to complete the second part of the FTF survey.

Senior Fitness Test. The SFT offers a quick and easy assessment of functional fitness, which is defined as “having the physiological capacity to perform everyday activities safely and independently without undue fatigue” (Rikli & Jones, 1999, p. 133). The assessment takes approximately 30 minutes and requires participants to complete six short assessment components (see Table 1). Each component is designed to measure a different aspect of functional fitness: flexibility (chair sit and reach & back scratch test), strength (arm curl &chair stand test), aerobic endurance (2-minute step test), and dynamic balance/agility (8-foot up-and-go). See Appendix D for SFT assessment protocol.

Table 1

Senior Fitness Test

Test Components	Instructions
Chair Stand Test	- Perform as many repetitions of sit to stand as possible in 30 seconds - Measure of lower-body strength
Arm Curl Test	- Perform as many seated dumbbell arm curls as possible with dominant hand in 30 seconds - Eight pound dumbbell for males - Five pound dumbbell for females - Measure of upper-body strength
2-Minute Step Test	- Perform as many marching steps on spot as possible in two minutes, counting every second step using a Sportline pedometer, model 4202 - Raise each knee to mid-thigh for the repetition to count - Measure of aerobic endurance
Chair Sit-And-Reach	- Sit on the edge of a chair with preferred leg extended straight out with heel in contact with the floor and ankle flexed at 90 degrees - Opposite leg is bent at 90 degrees with the foot flat on the floor - Reach out toward toes with both hands placed on top of the other, and middle fingers lined up - Score is distance between toes and fingers in inches, with a minus (-) score representing a short reach and a plus (+) score representing a reach that goes beyond the toes - Measure of lower body flexibility
Back Scratch Test	- Stand with one hand over the same shoulder and down the middle of the back - Opposite hand is placed under the same shoulder and up the middle of the back - Reach to overlap middle fingers - Score is the distance between the middle fingers in inches, with a minus (-) score representing distance short of touching; and a plus (+) score representing a degree of overlap - Measure of upper-body flexibility
8-Foot Up-And-Go	- Sit comfortably in a chair with a cone placed eight feet directly in front - Score is the time to get up, walk around the cone, and return to a seated position in the chair - Measure of agility and dynamic balance

Note. The SFT is from Rikli and Jones (2001).

Testing Procedure

Both fitness facilities provided a room for testing, as well as chairs for all participants. The testing rooms were large enough to accommodate up to ten participants at the same time. Upon arrival to a testing session, participants were provided with a seat, pen, and clipboard with a cover letter (Appendix B), consent form (Appendix B), and a FTF survey (Appendix C) attached.

Once consent was obtained, participants were instructed to begin the FTF survey, which consisted of two parts. Questions in Part A were to determine whether the participant thought that he/she was in an appropriate class and whether he/she believed that the FTF level for the class, as provided by the FTF tool, matched his/her perception of the class intensity. Participants were asked to complete Part A of the survey prior to commencing the SFT.

Once everyone in the session had completed Part A, as a group, they commenced the SFT. To warm up, participants were asked to march on the spot while performing range of motion exercises for two minutes. The student researcher guided the warm-up. Participants who had just completed an exercise class participated in a shorter warm-up. Those who were recruited by mail and who had not participated within an exercise class prior to testing participated in a warm-up of approximately five minutes.

Following the warm-up, participants performed the six assessment components of the SFT in the following order, as indicated in the SFT manual (Rikli & Jones, 2001): (1) chair stand test, (2) arm curl test, (3) two-minute step test, (4) chair sit-and-reach test, (5) back scratch test, and (6) eight-foot up-and-go test. Each participant was

provided with a data collection sheet to record results following each assessment component (see Appendix C). To maintain consistency, the research assistant demonstrated each assessment while the student researcher provided a scripted description of the assessment instructions. The student researcher facilitated the assessment by timing, measuring, counting repetitions, and recording data whenever required. Two research assistants also aided with facilitating the SFT.

Following completion of the SFT, the researcher reviewed the participant results to determine his/her composite FTF level, and reminded participants of their class FTF level as indicated by the FTF tool. Once individuals were provided with their FTF level and class FTF level, they were asked to complete Part B of the survey. The intent of Part B was to determine if the participants thought the FTF tool would be useful for helping older adults select an appropriate exercise class. Once completed, participants submitted their survey to the student researcher.

Quantitative Data Analyses

Participant performance levels on each of the six SFT assessments were ranked using the Functional Ranking Chart (see Appendix C) to establish a functional level from A (high) to D (low). All six functional levels received a weighted value with A equaling one, B equaling two, C equaling three, and D equaling four. The average of the six weighted components were calculated and rounded to the closest whole number; this value was converted back to a FTF level, representing the participant's composite FTF level. For example, if a participant scored four A levels and two B levels across the six assessments, this would convert to a score of eight, which averages to 1.3, and rounds to an composite A FTF level. Participants were then grouped into one of three

categories: matched (participant's FTF level matched the assigned exercise class FTF level), unmatched low (participant FTF level was below the assigned exercise class FTF level), and unmatched high (participant FTF level was above the assigned exercise class FTF level). Grouped survey results were analyzed with descriptive and frequency statistics using SPSS.

Qualitative Data Analyses

Participants were given the opportunity to provide feedback and justification to responses with follow-up open-ended questions. Relevant and constructive comments were considered to complement the statistical analyses. Participant citations are presented within the results section.

Results

The sample for this project included 60 participants, males (n = 1) and females (n = 59), who were aged 55 years and older and who lived in the Thunder Bay, Ontario area. Participants were recruited from those who attended one of the 28 exercise classes offered through the Canada Games Complex and the 55 Plus Centre, which were included in the development of the FTF tool. All 60 participants completed the SFT with no reported injuries. Seven participants chose not to respond to one or more FTF survey questions. In the final analysis, incomplete questions were excluded. To address the purpose of this thesis, participants were initially grouped into one of three categories: unmatched low (participant FTF level was below the assigned exercise class FTF level), matched (participant FTF level matched the assigned exercise class FTF level), and unmatched high (participant FTF level was above the assigned exercise class FTF level). The distribution of participants among the three groups was 35% of

participants (n=21) in both unmatched low and high groups, and 30% of participants (n=18) in the matched group. The results section is organized to present data on the underlying reasons for mismatched participants, and is expanded through three possible scenarios: (1) appropriateness of assigned exercise class FTF level, (2) appropriateness of the participant's self-selected exercise class, and (3) appropriateness of the SFT for assignment of participant FTF levels. In the results section, data obtained on the future applicability of the FTF tool will also be presented.

Demographics

The sample included 59 female participants and one male participant. The demographic information for this study was collected as part of the FTF survey. Age categories were grouped into age ranges of 10 years, starting at 55 years old. One participant chose to not report their age category. The most common age category was 65 to 74 years of age, with one participant in the 85 plus age category. Across the unmatched low group, mean experience (involvement within the class) was 4.9 years, suggesting that the unmatched low group was more experienced within their self-selected exercise class than the matched group ($\bar{x}$=2.3 years) and the unmatched high group ($\bar{x}$=2.2 years). Demographic information is provided in Table 2.

Table 2

Demographic Results

	Unmatched Low	Matched	Unmatched High
Female (N)	20	18	21
Male (N)	1		
Age Category			
55 – 64	3	8	8
65 – 74	12	7	9
75 – 84	4	3	4
85 +	1		
Mean Experience (Years)	4.9	2.3	2.2

Appropriateness of Assigned Exercise Class FTF Level

According to our results, there were no participants having an A participant FTF level engaged within an exercise class with an A FTF level. There were also 38% of participants identified at the A and B FTF levels (n=14) taking part within exercise classes with a C and D FTF level. Furthermore, 57% of participants identified at the C and D FTF levels (n=13) participated within A and B FTF level exercise classes. In Table 3, results are presented according to participant FTF level as related to exercise class FTF levels; this is followed by results across the four FTF level exercise classes.

Table 3

Participant FTF Level as Related to Exercise Class FTF Level

	Exercise Class FTF Level				Percentage Matched
	A (2 classes)	B (8 classes)	C (6 classes)	D (2 classes)	
Participant FTF Level					
A	0▫	5	2		
B	7	11▫	8	4	
C	6	6	4▫	2	
D		1	1	3▫	
Total Participants	13	23	15	9	30%

Note. ▫ indicates the matched group of participants

An A FTF level exercise class was described as one with complex and continuous movements, high intensity, high impact, and sustained aerobic endurance for over 20 minutes. Of the 13 participants who took part within an A FTF level exercise class, the analysis of qualitative data and FTF survey results showed that 31% (n=4) of respondents indicated their class would be more appropriately assigned as a B FTF level exercise class. As described by one participant: “I’m still wondering how our class was rated as an A [FTF level]. I think the [FTF tool] would be good if it was more accurate” (Participant #13). The mean experience level of the four participants was 3.3 years. Also, there were no A FTF level participants who took part in the A FTF level exercise classes. Fifty-four percent (n=7) of A FTF level exercise class participants were assigned a B FTF level with the remaining 46% (n=6) of participants being assigned a C FTF level, representing the unmatched low category.

The B FTF level exercise classes were described as moderate to high intensity classes, with coordinated and continuous movements. There were eight identified B FTF level classes within the exercise class sample. When class participants were questioned on their agreement with their assigned exercise class FTF level, all participants (n=23) unanimously agreed that their exercise class was classified appropriately. Additionally, the mean reported experience of the 23 participants was 3.7 years. The results for the B FTF level exercise classes indicated that 48% (n=11) of participants matched their class FTF level, 22% (n=5) of participants were unmatched high, and the remaining 30% (n= 7) of participants were unmatched low.

There were a total of six C FTF level exercise classes, which were described as incorporating slower and more controlled movements, shorter intervals, low impact, and low to moderate intensity. Twenty percent (n=3) of participants indicated through qualitative comments and FTF survey responses that their exercise class had been assigned the wrong FTF level. When questioned about their evaluation of the class rating, participants suggested that their class was more difficult than how it was described. The reported mean experience of the three participants was 4.4 years. Furthermore, according to our analyses 67% (n=10) of participants were categorized as unmatched high, 27% (n=4) of participants matched their class level, and one participants was unmatched low.

The D FTF level classes were described as those with simple movements for any fitness level, very low impact, and movements that focus on self-awareness. Classes assigned to the D FTF level are ideal for beginners and those with mobility limitations. In total there were two classes assigned to the D FTF level; however, one class was

identified as not being assigned appropriately since 75% (n=3) of participants, with a mean reported experience of 3.2 years, indicated in the analysis of qualitative comments that there were concerns the class may not be safe for individuals with mobility limitations. For example, one participant indicated “I don’t believe it is a low impact class and wouldn’t be safe for people in a wheelchair or use a cane” (Participant #4). When questioned about their agreement with their exercise class FTF level, all three class participants did not agree with the assigned FTF level. The results for the D level classes indicated that 33.3% (n=3) of participants matched their exercise class FTF level, leaving the remaining 66.6% (n=6) of participants categorized as unmatched high.

Appropriateness of Self-Selected Exercise Class

In this study participants were recruited from classes that they had self-selected for reasons which may include social factors such as, selecting a class to exercise with a friend. However, self-selecting an exercise class through social factors does not take into consideration whether the class is appropriate for an individual’s fitness level. The appropriateness of participants self-selected exercise class were provided through a combination of FTF survey responses and qualitative data, and results revealed two physical factors that may indicate the appropriateness of participants self-selected exercise class: reported pre-existing injuries/chronic disease and class intensity level.

Reported Pre-Existing Injuries/Chronic Disease. Of those in the unmatched low group, 57.1% (n=12) reported an injury/chronic disease when compared to 22.2% (n=4) of matched and 33.3% (n=7) of unmatched high groups (see Figure 2). The majority of participants with injuries/chronic disease indicated that they performed

modified exercises to compensate for their injury, such as “when my shoulder and/or hips are aching I must modify the exercise” (Participant #47). Types of injuries reported were both chronic and acute in nature, such as back injuries, cartilage tears in the knees and shoulders, and hip pain. Types of chronic conditions reported were arthritis in the knees and shoulders, high blood pressure, diabetes, and Parkinson’s disease.

Class Intensity Level. Thirty-three percent (n=7) of those who were in the unmatched low group reported that while exercising in their self-selected exercise class their class intensity level was too high at times when questioned about the class intensity level in relation to their self-perceived functional fitness level; this occurred more often than the 11.1% (n=2) of matched and 0.05% (n=1) of unmatched high group participants (see Figure 2). Often, when the intensity of the class was too high participants reported that they slowed down their pace. For example, one participant indicated that “I work at the session to ensure I get a good workout, but I do slow down if I feel over exerted” (Participant #5). In contrast, 66.7% (n=14) of the unmatched high group participants reported more often than the 55.5% (n=10) of matched and the 33.3% (n=7) of unmatched low that the intensity of their exercise class was too low at times. See Figure 2 for percentile results by three groups on responses regarding reported injuries and exercise intensity.

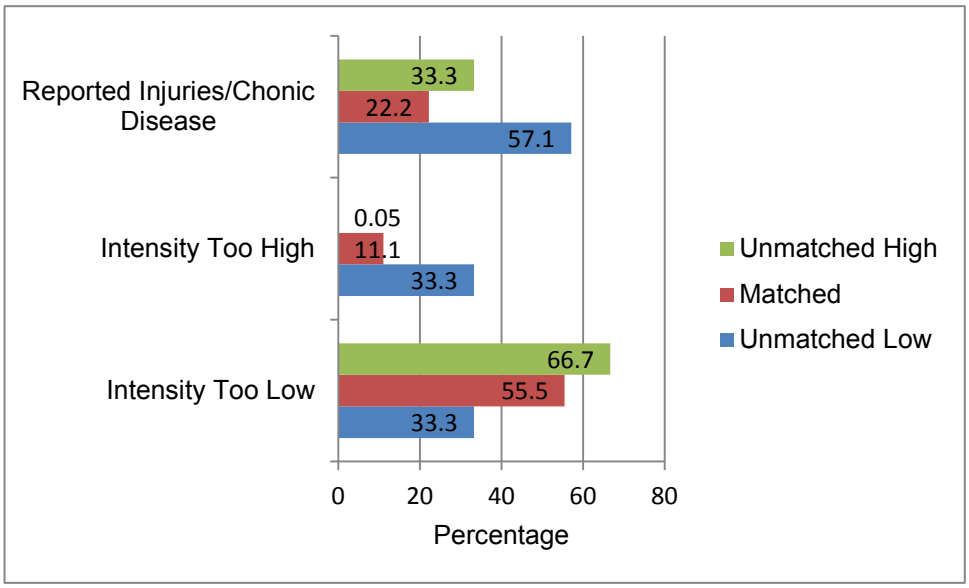

Figure 2. Participant responses on three separate FTF survey questions, with responses for each question separated into three participant groupings. Questions relate to reported injuries and/or chronic disease, intensity of the participant's exercise class being too high for his/her functional fitness level, and intensity being too low for his/her fitness level.

Appropriateness of Composite Senior Fitness Test Score

All 60 participants performed the six assessment components that encompass the SFT (Rikli & Jones, 1999). Scores were averaged across all six components and individuals were ranked into A, B, C, or D participant FTF level, which represented a composite functional fitness score. Half of the participants (n=30) scored in the B participant FTF level, whereas 12% (n=7) of participants scored within the A FTF level, 30% (n=18) in the C FTF level, and 8% (n=5) of participants scored in the D FTF level. When analyzing individual scores by each of the six assessment components, one way to assess the level of the FTF tool's accuracy may be to determine the percentage of individuals whose score on a particular assessment component was within the same level as their composite functional fitness level (participant FTF level). The percentage of participants with corresponding scores between their participant FTF level and a

particular assessment component might provide insight on how successful the assessment is in providing an indication of a participant's composite FTF level. For instance, two assessment components, the two-minute step test and the back scratch test, matched fewer than 40% of individuals with their participant FTF level. Sixty-two percent (n=37) of the two-minute step test participants scored above their participant FTF level, with the remaining 10% (n=6) scoring below their participant FTF level. For the back scratch test,35% (n=21) of participants scored above their participant FTF level and 31% (n=19) scored below their FTF level. The remaining four assessments matched over 40% of participants with their participant FTF level, with the eight foot up-and-go matching 67%(n=40) of participants. In table 4, results are presented for all SFT.

Table 4

Individual Scores Across all Six Senior Fitness Test Assessment Components

	Participant FTF Level (n)				% Corresponding With Participant FTF Level
	A (7)	B (30)	C (18)	D (5)	
Chair Stand					
A	5▫	8			
B	1	10▫	2		
C	1	8	8▫	1	
D		4	8	4▫	45
Arm Curl					
A	5▫	8			
B	2	9▫	4		
C		12	13▫	2	
D		1	1	3▫	50
Two-Minute Step					
A	7▫	23	9	1	
B		4▫	4		
C		1	2▫		
D		2	3	4▫	28
Chair Sit and Reach					
A	6▫	8	1		
B	1	11▫	5	2	
C		11	9▫	2	
D			3	1▫	45
Back Scratch					
A	4▫	10	1		
B	3	11▫	7	1	
C		3	3▫	2	
D		6	7	2▫	33
Eight Foot Up-and-Go					
A	6▫	5			
B	1	22▫	4		
C		3	8▫	1	
D			6	4▫	67

Note. ▫ indicates scores that correspond with participant FTF level

Future Applicability of the FTF Tool

Information on the participants' views of the future applicability of the FTF tool was collected as part of the FTF survey in an effort to determine if the tool would be useful for individuals when selecting an exercise class that fits their fitness level. The

results indicated that the majority of individuals (62%) would use the FTF tool to decide on a future class (see Figure 3); in fact, it was a recurrent comment amongst participants. One participant stated that he/she has “attended classes that I could not keep up with, which was frustrating. Attending a class that is right for me is better spiritually” (Participant #21). In contrast, only 15% of participants indicated that they would not use the FTF tool to select a future class. Recurrent themes suggested that those who would rarely use the FTF tool are concerned about the accuracy of exercise class FTF levels, as indicated by a participant: “I think that [the FTF tool] would be good if it was more accurate” (Participant #13). The remaining 23% of participants indicated that they would occasionally use the FTF to decide on a future class.

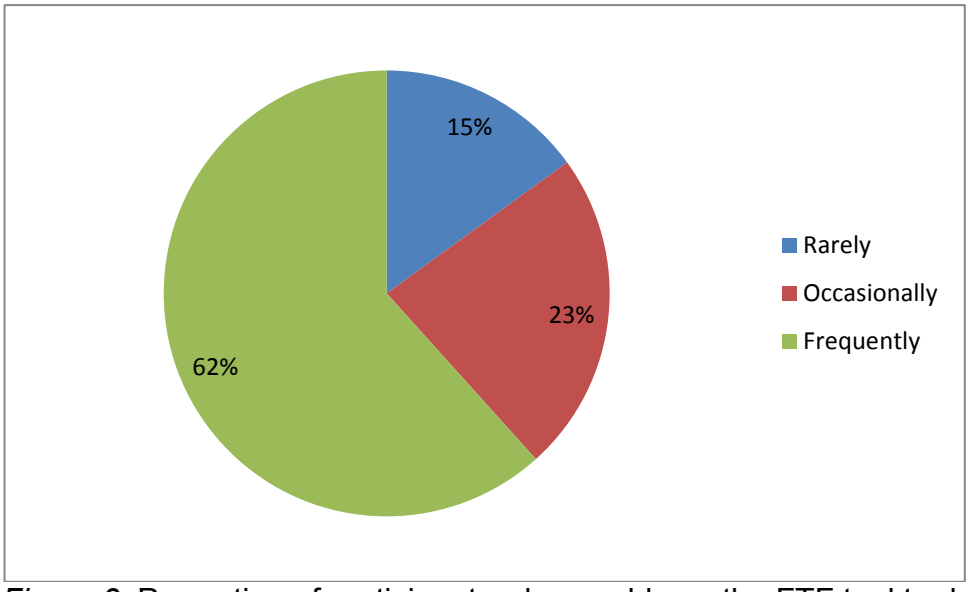

Figure 3. Proportion of participants who would use the FTF tool to decide on a future exercise class.

Another reoccurring comment was that the functional fitness testing was valuable in helping participants increase their knowledge of their physical ability. One participant stated that it is “good to know what I need to work on, especially upper body strength” (Participant #31). It was also suggested that the functional fitness testing

would be excellent for measuring improvements over time through a pre-exercise and post-exercise assessment. For example, “to measure for improvement, assess before class and at the end of a session” (Participant #50). It was also reported that knowing an exercise class FTF level would help people choose classes that may challenge their functional ability, which was identified as an important aspect of selecting a class. For example, “it is nice to know my fitness level in order to ascertain whether to remain at the same level of fitness or to challenge myself” (Participant #37).

When questioned if the FTF tool would be helpful for others to select an appropriate class, the majority of participants (88%) in this study agreed that the FTF tool would be excellent for others, especially for beginners who are inexperienced with group exercise classes (see Figure 4), as indicated by a participant: “it would give beginners more information to help them start a class” (Participant #31). A tool such as the FTF would be useful for those who have recently completed a rehabilitation program, such as “the back institute when people are ready to leave rehab and to help them choose the appropriate exercise class” (Participant #15). A participant also indicated that the FTF tool is a “great idea, especially for people who might be otherwise intimidated to start a program” (Participant #34). Only two percent of participants indicated that the FTF tool would not be good for helping others select an exercise class, with the remaining 10% indicating that it would occasionally be good for others (see Figure 4).

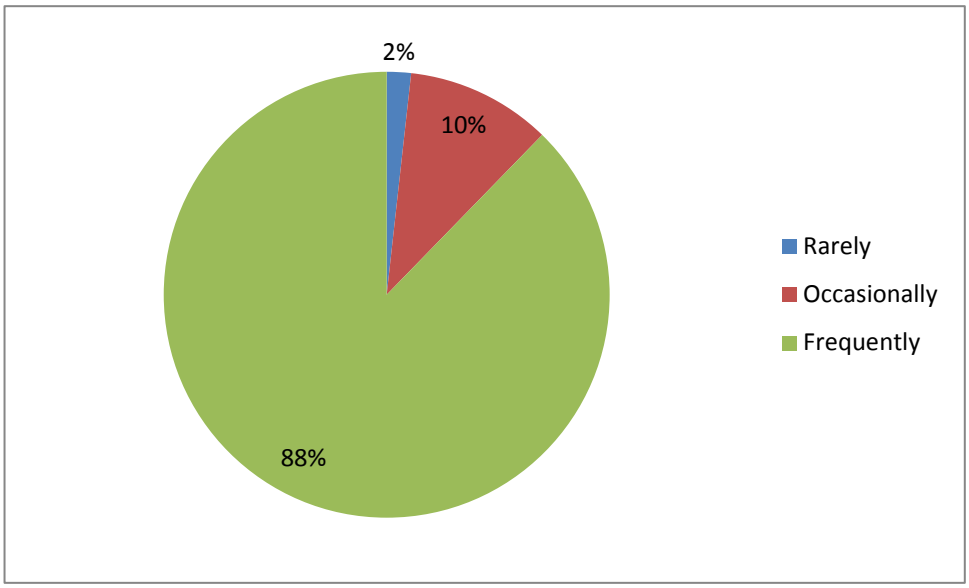

Figure 4. Proportion of participants who indicated that the FTF tool would help others select an exercise class.

Discussion

The primary goal of this study was to assess the effectiveness of the FTF tool by evaluating whether the participant FTF level matched his/her self-selected exercise class FTF level, and to determine the underlying factors for any mismatch. In total, 30% of participants (n=18) recruited in the study matched their self-selected exercise class FTF level, leaving 35% unmatched low (participant FTF level was below the assigned exercise class FTF level; n=21) and 35% unmatched high (participant FTF level was above the assigned exercise class FTF level; n=21). The following discussion presents and explores possible underlying factors for mismatched participants, as well as the possibilities for the future applicability of the FTF tool.

Demographics

This study recruited one male participant out of 60, and one participant who was 85 years or older. These demographics highlight the reality that not many males take part in group based exercise classes and that the oldest-old cohort is the least

active (CIHI, 2011), which is similar to what has been reported in the literature (Whaley & Ebbeck, 1997). The lack of males and those who were 85 years and older (oldest old) highlights a need for a community initiative to tailor exercise classes to accommodate or increase participation among men and the oldest old. In addition, the sample highlights a delimitation of this study, suggesting that results can only be generalized to an older adult female population, mainly between the ages of 55 to 84. The mean reported experience within a self-selected exercise class may provide more information on a possible factor for mismatched participants.

Mean experience of the sample provides insight into the participants' exercise habits. The unmatched low group (participant FTF level was below the assigned exercise class FTF level) reported a mean experience of 4.9 years, which was higher than both the matched ($\bar{x}$=2.3 years) and unmatched high ($\bar{x}$=2.2 years) groups. Rhodes and colleagues (1999) report that within the first six to twelve months more than 50% of older adults will drop out of a newly adopted exercise routine, suggesting that the sample had an elevated experience level. In other words, the sample was able to adhere to their selected exercise class. The literature indicates that there are four main factors that can improve exercise adherence: addressing barriers (Rhodes, 1999), improving self-efficacy (Clark, 1999; McAuley, 1992; Rhodes, 1999), perceiving choice (Rhodes, 1999), and identifying progress (Chao et al., 2000; McAuley, 1992). It is possible that all three groups were able to meet the four factors associated with exercise adherence, which would explain the multiple years of experience in their self-selected class. However, those who were grouped into the unmatched low category had a reported mean of 4.9 years of experience within their exercise class, which was more

than twice that of the matched and unmatched high groups. There is a possibility that extensive experience within the same exercise class, and not being able to identify progress through a concrete measure of fitness level, has resulted in diminished physical gains for the unmatched low group; a possibility that could point towards future research that incorporates the FTF tool as an instrument to help identify progress.

Currently, the best practice for identifying progress over time is through goal setting and striving to achieve the goal through improved physical performance as a result of exercise (Chao et al., 2000). Furthermore, Kramer and Ratamess (2004) report that variation in an exercise regimen is important to establish continued progression in physical gains, suggesting that performing the same exercise regimen over several years can diminish the benefits of exercise. Through a concrete measure of identified progress, such as the FTF tool, individuals can be provided with information that can initiate variation through choosing a more appropriate class to improve physical gains.

Ory and colleagues (2005) suggest that a functional fitness assessment may be used as an ongoing assessment of physical performance. For example, when starting an exercise program an individual might be matched with a low-intensity exercise class for beginners, but over time an individual's functional fitness level will improve. Through ongoing assessment, an individual may re-evaluate his/her functional fitness and then be able to match himself/herself accordingly with a slightly more advanced exercise class in order to initiate continued improvement. Similarly, Resnick and colleagues (2008) suggest that ongoing assessment can serve as a motive to continually challenge an individual to improve fitness levels. The FTF tool provides a functional fitness assessment that can be utilized as an ongoing assessment. Through continually

matching individuals with an appropriate exercise class, older adults would then be encouraged to introduce variation within their exercise regimen.

The FTF tool provides an opportunity to offer individuals a concrete measure for identifying progress, which can improve adherence to exercise (Chao et al., 2000; McAuley, 1992). In addition, ongoing assessment might help those who improve beyond their class level to select a more appropriate exercise class, avoiding an unmatched categorization.

Appropriateness of Assigned Exercise Class FTF Level

For this study, all exercise classes were assigned an FTF level based on interviews with the class instructors, which allowed the researcher to develop relationships with the exercise class instructors and the facility coordinators. However, there is a possibility that some class instructors' perception of their class intensity did not match the reality of their class fitness level, resulting in a higher number of unmatched participants. For 15% of participants, having an inaccurately-rated exercise class actually discouraged them from wanting to use the FTF tool to select a future class, a scenario that highlights the importance of exercise class level accuracy. Perhaps the subjectivity of conducting instructor interviews may have resulted in assigning exercise classes with an inappropriate FTF level. Additional means for assigning the correct FTF level to existing community exercise classes may be to examine participant agreement/disagreement with assigned exercise class FTF level and/or use participant FTF level to objectively assess an exercise class FTF level, which were measures examined in the current study.

Results indicated that 31% of A FTF level exercise class and 20% of C FTF level class participants strongly disagreed with their assigned class FTF level. Participant disagreement/agreement with assigned exercise class FTF level may provide a secondary subjective component that can be used to help assign class FTF levels. Additional results showed that the A FTF level classes did not accommodate any matched participants, 67% of C FTF level classes accommodated unmatched high participants, and for one D FTF level exercise class all participants were unmatched high. These results highlight the possibility of using class participants' composite functional fitness score as an objective measure to help assign exercise class FTF levels. In analyzing class participants' subjective and objective results may indicate that some exercise classes were not assigned an appropriate FTF level based on instructor interviews alone.

These results could point towards an adjustment to the method for assigning an exercise class FTF level. In addition to the instructor interviews, class participants could be recruited to assess their composite functional fitness level. Therefore, classes would be assigned an FTF level based on the combination of both objective participants' composite functional fitness results and subjective instructor interview results. Combining subjective and objective results to assign a class level should be considered for future research.

Originally, the interview with exercise class instructors was conducted to determine the functional fitness level that a beginner exerciser would need to exercise comfortably within the exercise class. In other words, instructors were asked "what functional fitness level is required for a beginner exerciser to comfortably participate

within your exercise class?" The sample for this study was extensively experienced within their self-selected exercise class, and perhaps their experience played a role in their disagreement with the assigned exercise class FTF level. For this reason, it might be best to study the matching capability of the FTF tool with a sample of beginner exercisers. In addition to the appropriateness of class FTF levels, participants may have self-selected an exercise class that was not appropriate for their functional fitness level, representing another possible factor that explains mismatched participants.

Appropriateness of Self-Selected Exercise Class

While improper classification of class FTF level could be the root of some mismatching between individual ability and class demand, another potential factor would be participants self-selecting an inappropriate exercise class based on their composite functional fitness level. Data collected on the appropriateness of the participant's selected class to determine if a participant is in a class that is either above or below his/her fitness level might provide an explanation for any unmatched participants. Analysis of the data from the FTF survey Likert-type responses and qualitative comments revealed two physical factors that might help determine if a participant was in an inappropriate class: reported pre-existing injuries, and class intensity level.

Reported Pre-Existing Injuries/Chronic Disease. When analyzing reported pre-existing injuries and chronic disease those who are in the unmatched low group reported almost twice the number of injuries and chronic diseases than both the matched and unmatched high groups. This result indicates that the majority of individuals with pre-existing injuries and chronic disease are in a class that is more

advanced than their composite functional fitness level. Although data on pre-existing injuries was not detailed and it remains unknown when the injury was sustained, perhaps participants may have sustained the injury as a result of being in a class that is too advanced; this highlights a potential safety issue that could be addressed by the FTF tool through matching individuals with appropriate classes.

When dealing with health problems, gathering the knowledge necessary to select a class that is appropriate can be difficult (Moschny et al., 2011). Schutzer and Graves (2004) report that health problems are the most common barrier to exercise for older adults, but Moschny et al. (2011) contend that individuals with health problems and injuries should continue exercising to help overcome health barriers. This project emphasizes the importance of participants finding a class that suits their functional ability; for this group, it is apparent that they did not. Individuals with chronic diseases and injuries represent a portion of the older adult population that can serve to benefit from the knowledge provided by the FTF tool as it could help them select a class that will more appropriately match their functional fitness level.

Class Intensity Level. Data on class intensity were collected in an effort to analyze whether participants in the unmatched groups have selected a class that is too advanced or too easy for their functional fitness level. One-third of the unmatched low group reported the intensity of the class was too high, suggesting that they were in a class that was too advanced for their functional ability. For some individuals, being in an exercise class that is too advanced can cause a threat to self-efficacy due to negative experiences within the exercise class. For example, through qualitative responses it was identified that those who are in a class with an intensity level that is too high have

to slow down while the rest of the class continues at the class pace, highlighting a negative experience for some. Exercise self-efficacy is related to the individual's perception of his/her exercise ability (Lees et al., 2005). If, by chance, a participant selected an exercise class that was too advanced, to the point where he/she is not able to keep up with the rest of the class, low self-efficacy that can affect exercise adherence may develop (Rhodes, 1999). Self-efficacy remains one of the most important aspects of exercise adherence (McAuley, 1992). However, with a tool such as the FTF, participants can more appropriately select an exercise class within their functional fitness range, providing positive exercise experiences, allowing for improved self-efficacy.

In contrast, almost three-quarters of the unmatched high group reported that their exercise class intensity level was too low, and almost never too high. This response is what would be expected of a participant who is exercising in a class that is too easy for his/her functional fitness level. To experience all the physical benefits of exercise, the Canadian Society of Exercise Physiology suggests that older adults exercise at a moderate to vigorous intensity level (CSEP, 2012). If an unmatched high participant is exercising in a class that does not allow him/her to reach a moderate to vigorous intensity level, progress in physical conditioning might be compromised. Chao and colleagues (2000), state that the ability to identify progress in physical function can improve exercise adherence. If individuals were to use the FTF tool to select a class that matches their functional fitness level there is a possibility that they would exercise in a class that allows them to reach a moderate to vigorous intensity level, providing an improvement to adherence levels. Expanding on class intensity as a factor that may

explain unmatched participants, it is possible that the composite SFT scores resulted in mismatched participants.

Appropriateness of Composite Senior Fitness Test Score

As suggested by Morey and Sullivan (2003), using a functional fitness assessment to promote exercise by matching individuals with existing community exercise classes would be a valuable and meaningful form of exercise prescription. In this research, the SFT was a practical tool to evaluate functional fitness as it provided a quick evaluation for multiple individuals at the same time while using readily accessible equipment. Although the SFT is a reliable and valid tool (Rikli & Jones, 2001), the method of scoring the SFT to determine a composite functional fitness level was developed for ease of use in the current study. Furthermore, assessing and establishing a composite functional fitness level is ideal for matching participants with existing community exercise classes, if proven reliable. As proposed by Thompson and colleagues (2006), an evaluation study that assesses the matching capability might provide an initial overview of a tool's effectiveness. Analysis of results in this study makes it possible to identify which assessments provide a better matching capability, such as the eight-foot up-and-go.

The eight-foot up-and-go had 67% of participants scored within the same level as their composite participant FTF level, representing the highest matched assessment. This result may indicate that the eight-foot up-and-go is the most accurate representation of composite functional fitness when compared with the remaining five assessments. However, the eight-foot up-and-go assessment only evaluates balance, mobility, and agility, which are all components that make up only a portion of functional

fitness. Without the addition of the remaining five assessments we cannot evaluate functional fitness as a whole. Therefore, the eight-foot up-and-go representing the highest matched assessment can only suggest that the participants' balance, mobility, and agility performance was comparable to their composite functional fitness.

Along the same reasoning as the eight-foot up-and-go, evaluating the ability for a participant's assessment to correspond with his/her composite functional fitness level provides insight into the physical strengths and weaknesses of the sample. For instance, the two-minute step test and the back scratch test matched less than 40% of participants with their composite functional fitness level. Through further examining the two-minute step test results, 62% of participants scored above their participant FTF level, suggesting that the aerobic endurance (a physical parameter measured by the two-minute step test) of the sample was more developed as compared to their composite functional fitness level; a conclusion that is possible as the sample was comprised of experienced exercisers.

Moreover, the back scratch test presented a more uniform result with 33% of participants scoring within the same level as their composite functional fitness, 35% scored above their composite functional fitness level, and 31% of participants scored below their composite level. This result may suggest that a fairly equal number of individuals had both difficulty and ease with upper body flexibility (a physical parameter measured by the back scratch test). Although the SFT data provides additional insight on the functional fitness of the sample, at this point in time it is difficult to determine whether the SFT assigned participants to a reliable composite functional fitness (FTF) level. It remains a possibility that participants may have been unmatched as a result of

being assigned an incorrect FTF level; however, to determine the accuracy of composite functional fitness there is a need for a future test-retest reliability study.

It has been identified that there is a need for a functional fitness assessment to be used within the pre-participation screening process (Chodzko-Zajko & Resnick, 2004; Morey& Sullivan, 2003; Ory et al., 2005). A functional fitness assessment can be used as a baseline measure, and through ongoing assessment individuals can identify improvements in functional fitness (Ory et al., 2005; Resnick et al., 2005). Additionally, a functional fitness assessment can lend itself to self-assessment where an individual can be provided with instructions on how to perform and score each assessment (Morey & Sullivan, 2003). Most importantly, through a functional fitness assessment meaningful exercise prescription can be implemented where a participant is matched with an exercise class based on his/her fitness level (Resnick et al., 2005). The benefits of using a functional fitness assessment in the pre-participation screening process and/or during ongoing exercise pursuit are endless. However, to the researcher's knowledge, no attempt has been made to utilize a functional fitness assessment to achieve these benefits.

This study has provided a preliminary attempt at using a functional fitness assessment (the SFT) to evaluate individuals' composite functional fitness level, a measure that has never before been calculated with the SFT. The importance of a composite functional fitness measure is that it provides a single score that can be used to match participants with a single score that represents a class level. Furthermore, this study has demonstrated the feasibility of assessing composite functional fitness using the SFT within an older adult population. However, there is a need to further

demonstrate the accuracy of the composite functional fitness score, which can be established through a future test-retest reliability study (Morrow, 2002). With the SFT as a component of the FTF tool there have been several identified future applications.

Future Applicability of the FTF Tool

In analyzing participants' views on the future applicability of the FTF tool it becomes apparent that participants' views parallel the older adult exercise prescription literature. As a whole, participants value the idea of the FTF tool and how it can benefit the older adult population; this being evident since 62% of participants indicated that they would use the FTF tool to decide on a future class. The FTF tool is intended to help match participants with existing community exercise classes, and from the matched classes a participant can choose a class that appeal to him/her. Some participants identified that choosing a class with little to no information can be difficult. Selecting a class that does not match a participant's fitness level may have a negative effect on self-efficacy (Costello et al., 2011), which may further affect a participant's adherence to his/her selected class (Rhodes, 1999). A total of 15% of participants indicated that they would not use the FTF tool and through analysis of qualitative comments, these participants highlighted that the accuracy of the tool is important to establish before they reconsider using the tool. This response suggests a need for future research to establish accurate class FTF levels.

In addition to the matching capability and the accuracy of the FTF tool, other aspects were seen as a benefit to participants. For example, participants within this study identified the SFT's ability to improve knowledge of individual physical ability. Through undergoing the SFT assessment, participants were able to better understand

how functionally fit they were and more importantly, what aspects of their fitness they needed to improve. Participants' lack of knowledge about their fitness level was a barrier reported in the literature (Moschny et al., 2011), and through this study it is apparent that the use of the SFT could be valuable in aiding participants to overcome this barrier. It was also identified by participants that the FTF tool may lend itself to help identify improvements over time, which was one of the major factors related to improved exercise adherence (McAuley, 1992). As recognized through this study, the benefits of the FTF tool are numerous for inexperienced and experienced exercisers alike.

Originally, the FTF tool was developed to fill a community need: some older adults require assistance choosing an exercise class that fits their fitness level. It was identified through qualitative comments that those who have graduated from a physical rehabilitation program could be considered as beginner exercisers who were directed by their physicians to start exercising. These individuals, and others like them, may not know where to begin to find an appropriate exercise class, a finding that was similar to suggestions made by Resnick and colleagues (2008).Study participants also indicated the value of the FTF tool for beginners, as suggested by 88% of participants. For this reason among others, the FTF tool should be further studied on a sample of beginner exercisers to evaluate if the tool can successfully match participants with existing community classes that can accommodate their functional fitness level.

Although the FTF tool may be beneficial for informing the physical aspect of class selection, there are other social factors that may also influence class selection. For instance, respondents identified that they may choose an exercise class because of a friend's participation in it, or because a friend recommended a certain class. For

example, “many people choose a class because of a friend’s recommendation, the instructor, or the day and time of the class” (Participant #24). In addition, participants recognized that knowing the instructor and his/her teaching techniques may also play a role in class selection. Some individuals identified that they had “favourite” instructors, and that they were more inclined to select a class that the particular instructor teaches, such as “I would rather go to a class with an instructor who is a good fit for me” (Participant #15). These findings represent social factors that could influence class selection that are not directly included as part of the FTF tool. However, the FTF tool incorporates a choice-based component where individuals can make an informed decision on which class interests them. For instance, participants can choose a class that matches their functional fitness level while accommodating their social needs.

Conclusion

This study was a preliminary descriptive project that contributed to the development of the first individualized, choice-based, matching tool for older adults that incorporated existing community exercise classes. The purpose of this study was to assess the reliability of the FTF tool through assessing if participants match their class FTF level, and to identify any underlying factors for unmatched participants. Thirty percent of the participants in this study matched their self-selected exercise class FTF level. In addition, three possible reasons for mismatch have been identified: the participant may have selected a class that was not appropriate to his/her functional fitness level, the class FTF level may not have been assigned appropriately, and/or the SFT may not have assigned individuals with an appropriate FTF level.

Overall, the FTF tool provides the potential to distinguish between whether participants are matched or unmatched with the functional fitness level of their self-selected exercise program. This research project was the first of its kind to use the SFT to determine participants' composite functional fitness level. To establish whether this method of scoring the SFT is accurate further possible research could be conducted, such as a test-retest reliability study. Additionally, the utilization of the SFT allowed participants to improve their personal fitness knowledge, helping them to understand their current fitness level and what aspects of their fitness level may need improvements. The FTF tool also lends itself to the possibility of ongoing assessments providing participants with the ability to identify progress over time. Similarly, this research project was the first to assign exercise classes with an intensity level based on functional fitness. However, possible future research may want to explore the possibility of using a combination of subjective instructor interviews and objective class participants' functional fitness results to establish a class level.

The sample for this study recruited one male participant, which represented an imbalanced ratio between older adult male and female participants. This ratio raises a concern that older adult males are not utilizing exercise classes in the community. Future research should further investigate reasons for this imbalanced gender ratio.

One of the major findings of this study was that the majority of participants indicated that the FTF tool would be useful to help beginners select an appropriate exercise class for his/her functional fitness level. With this finding, the logical next step for the FTF tool would be to assess the matching capability of the tool on a sample of beginner exercisers.

Recommendations for Community Exercise Classes

Through this project, researchers have identified potential future community initiatives:

1. The sample for this study indicated a lack of exercise participation from males and the oldest-old (85+) cohort. It is recommended that the community takes steps towards developing exercise classes geared towards accommodating these unrepresented segments of the population.
2. Many communities provide an exercise class catalogue, (e.g., The Thunder Bay Key), which describes a variety of activities that are offered at several public facilities throughout the area. It was identified that the exercise class descriptions are not detailed enough for individuals to understand the fitness level needed to participate comfortably within a class. It is recommended that facilities provide more detailed descriptions of their exercise classes.
3. It was also identified that conducting interviews with exercise class instructors provided an opportunity for reflection on their exercise class and the population that the class is intended to accommodate. These interviews were identified as very helpful, and perhaps it would be good practice to adopt a similar interview process with other local facilities.

References

American College of Sports Medicine. (2009). *ACSMs guidelines for exercise testing and prescription* (8th ed.). Philadelphia, Penn: Lippincott, Williams, and Wilkins.

American Psychological Association. (1985). *Standards for educational and psychological testing.* Washington, DC: American Psychological Association.

Avers, D. (2010). Community-based exercise programs for older adults. *Topics in Geriatric Rehabilitation, 26*(4), 275 – 298.

Canadian Society of Exercise Physiology.(2012). Canadian physical activity guidelines for older adults – 65 years and older. Retrieved from http://www.csep.ca/english/view.asp?x=804

Canadian Institute for Health Information. (2011). *Health care in Canada, 2011: A focus on seniors and aging.* Retrieved from http://www.cihi.ca

Clark, D. O. (1999).Identifying psychological, physiological, and environmental barriers and facilitators to exercise among older low income adults. *Journal of Clinical Geropsychology, 5*(1), 51 – 62.

Costello, E., Kafchinski, M., Vrazel, J., & Sullivan, P. (2011).Motivators, barriers, and beliefs regarding physical activity in an older adult population. *Journal of Geriatric Physical Therapy, 34*(3), 138 – 147.

Chaitman, B. R. (2011). Exercise stress testing. In: Bonow, R. O., Mann, D.L., Zipes, D.P., & Libby, P., eds. *Braunwald's heart disease: A textbook of cardiovascular medicine* (pp. 164 – 199). 9th ed. Philadelphia, Pa: Saunders Elsevier.

Chao, D., Foy, C. G., & Farmer, D. (2000). Exercise adherence among older adults: Challenges and strategies. *Controlled Clinical Trials, 21*, 212S – 217S.

Chodzko-Zajko, W. J., & Resnick, B. (2004).Beyond screening. *The Journal on Active Aging, 3*(4), 26 – 29.

Chodzko-Zajko, W. J. (2013). *ACSMs exercise for older adults.* Baltimore: Lippincott William & Wilkins, a Wolters Kluwer Health.

Health Canada. (2002).*Healthy Aging: Physical Activity and Older Adults.* Division of Aging Seniors. Ottawa: Ministry of Public Works and Government Services, Canada.

Larocque, T., Lang, J., Farrell, J., Newhouse, I., & Paterson, G. (2013). *Developing Fitness that Fits: An individualized, choice-based, matching tool for older adults* (Unpublished study). Lakehead University, Thunder Bay ON.

Lees, F. D., Clark, P. G., Nigg, C. R., & Newman, P. (2005). Barriers to exercise behavior among older adults: A focus-group study. *Journal of Aging and Physical Activity, 13*, 23 – 33.

Mahar, M. T. & Rowe, D. A. (2002). Construct validity in physical activity research. In G. Welk (Eds.), *Physical activity assessments for health-related research* (pp. 51 – 72). Champaign, IL: Human Kinetics.

McAuley, E. (1992). Self-efficacy and the maintenance of exercise participation in older adults. *Journal of Behavioral Medicine, 16*, 103 – 113.

Morey, M. C., & Sullivan, R. J. Jr. (2003).Medical assessment for health advocacy and practical strategies for exercise initiation. *American Journal of Preventive Medicine, 25*(3), 204 – 208. doi:10.1016/S0749-3797(03)00180-6

Morrow, R. J. (2002). Measurement issues for the assessment of physical activity. In G. Welk (Eds.), *Physical activity assessments for health-related research* (pp. 37 – 49). Champaign, IL: Human Kinetics.

Moschny, A., Platen, P., KlaaBen-Mielke, R., Trampisch, U., &Hinrichs, T. (2011). Barriers to physical activity in older adults in Germany: A cross-sectional study. *International Journal of Behavioural Nutrition and Physical Activity, 8*, 121 – 131.

Nied, R. J., & Franklin, B. (2002). Promoting and prescribing exercise for the elderly. *American Family Physician, 65*(3), 419 – 426.

Ontario Local Health Integration Network, North West Local Health Integration Network (LHIN). (2011). *Population health profile*. Retrieved from http://www.northwestlhin.on.ca/

Ory, M., Resnick, B., Jordan, P. J., Coday, M., Riebe, D., Garber, C. E., Pruitt, L., & Bazzarre, T. (2005). Screening, safety, and adverse events in physical activity interventions : Collaborative experiences from the behavior change consortium. *Annals of Behavioral Medicine, 29*, 20 – 28.

Rasinaho, M., Hirvensalo, M., Leinonen, R., Lintunen, T., & Rantanen, T. (2006). Motives for and barriers to physical activity among older adults with mobility limitations. *Journal of Aging and Physical Activity, 15*, 90 – 102.

Resnick, B., Ory, M., Coday, M., & Riebe, D. (2005). Older adults' perspectives on screening prior to initiating and exercise program. *Prevention Sciences, 6(*3), 203 – 211. doi: 10.1007/s11121-005-0011-4

Resnick, B., Ory, M., Coday, M., & Riebe, D. (2008). Professional perspectives on physical activity screening practices: Shifting the paradigm. *Critical Public Health, 18*, 21 – 32. doi:10.1080/09581590701771717

Rikli, R. E., & Jones, C. J. (1999). Development and validation of a functional fitness test for community-residing older adults. *Journal of Aging and Physical Activity*, 7, 129 – 161.

Rikli, R. E., & Jones, C. J. (2001).*Senior fitness test manual.* Champaign, IL: Human Kinetics

Rhodes, R. E., Martin, A. D., Taunton, J. E., Rhodes, E. C., Donnelly, M., & Elliot, J. (1999). Factors associated with exercise adherence among older adults: An individual perspective. *Sports Medicine, 28*(6), 397 – 411.

Scott, V., Wagar, L., & Elliott, S. (2010). Falls and related injuries among older Canadians: Fall-related hospitalization and intervention initiatives. Prepared on behalf of the Public Health Agency of Canada Division of Aging and Seniors. Victoria BC: Victoria Scott Consulting.

Schutzer, K. A., & Graves, B. S. (2004).Barriers and motivations to exercise in older adults. *Preventive Medicine, 39*, 1056 – 1061.

Sepsis, P. G., Stewart, A. L., McLellan, B., Mills, K., King, A. C., & Shoumaker, W. (1995). Seniors' ratings of the helpfulness of various program support mechanisms utilized in a physical activity promotion program. *Journal of Aging and Physical Activity, 3*, 193 – 207.

Statistics Canada.(2006). *A portrait of seniors in Canada* (Catalogue no. 89-519-XIE). Retrieved from http://www.statscan.ca

Stewart, A. L., Sepsis, P. G., King, A. C., McLellan, B. Y., & Ritter, P. L. (1997). Evaluation of CHAMPS, a physical activity promotion program for older adults. *Annals of Behavioral Medicine, 19*(4), 353 – 361.

Stewart, A. L., Verboncoeur, C. J., McLellan, B. Y., Gillis, D. E., Rush, S., Mills, K. M., King, A. C., . . . Bortz, W. M. (2001). Physical activity outcomes of CHAMPS II: A physical activity promotion program for older adults. *Journal of Gerontology: Medical Sciences, 56*(8), M465 – M470. Doi:10.1093/Gerona/56.8.M465

Stewart, A. L., Gillis, D., Grossman, M., Castrillo, M., Pruitt, L., McLellan, B., & Sperber, N. (2006).Diffusing a research-based physical activity promotion program for seniors into diverse communities: CHAMPS III. *Preventing Chronic Disease, 3*(2), 1 – 16.

Stryker, L. A., Duncan, S. C., Chaumeton, N. R., Duncan, T. E., & Toobert, D. J. (2007). Reliability of pedometer data in a sample of youth and older women. *International Journal of Behavioral Nutrition and Physical Activity, 4*(4). doi: 10.1186/1479-5868-4-4

Thompson, N., Kegler, M. C., & Holtgrave, D. R. (2006).Program evaluation. In R. Crosby, R. DiClemente, & L. Salazar (Eds.). *Research methods in health promotion* (pp. 199 – 225). San Francisco, CA: Jossey-Bass.

Whaley, D. E., & Eddeck, V. (1997). Older adults' constraints to participation in structured exercise classes. *Journal of Aging and Physical Activity, 5*, 190 – 212.

List of Appendices

Appendix A – The Fitness that Fits Tool

Fitness that Fits Tool

Exercise Class Fitness that Fits Level

Fitness that Fits Functional Rankings Chart

Fitness That Fits (FTF) Scale

A	*Advanced fitness level exercise classes* Choose an A class if you can withstand: • Complex and continuous movements • Higher degree of coordination and balance • Higher intensity and higher impact • Sustained aerobic endurance (20+ minutes) • Higher level of strength/core strength A classes are recommended for those who are more functionally fit
B	*Moderate fitness level exercise classes* Choose a B class if you can withstand: • Continuous movements • Coordinated movements • Moderate to higher intensity levels • Interval cardio/resistance exercises at low to high intensity B classes require increased body awareness, balance and moderate levels of strength/core strength
C	*Lower fitness level exercise classes* Choose a C class if you need to build fitness levels by engaging in: • Slower and more controlled movements • Shorter interval exercises of low to moderate intensity • Movements of lower degree of coordination and balance • Exercises of lower impact C classes focus on building strength and fitness and working at your own pace with an emphasis on safety
D	*Beginner fitness level exercise classes* Choose a D class if you need to build fitness levels by engaging in: • Activities of very simple movements for any level of fitness • Very low impact exercise (seated, standing optional) • Exercises that require limited strength, balance and flexibility • Activities that focus on self-awareness D classes are used as a starting point to build fitness levels and are safe for those with a wheel chair, walker, or cane or other assistive devices

(Lakehead University Letterhead)

Exercise Classes FTF Level

Strong Seniors

FTF Level - A **Avg Size: 25 – 30** **Canada Games Complex** **T & F @ 9 – 10 am** **Karen Gorst-Vigliarolo**	• An advanced class, focusing on strengthening and toning • Components include complex movement and coordination skills, continual movement for the hour, and high endurance and impact • If you already have some experience with strengthening, this class will help you progress to the next step.

Low Impact Aerobic

FTF Level – A **Avg Size: 20** **55 Plus Centre** **M & W 1:30 – 2:30 pm** **Lisa Geurts**	• Focuses on moderate to high intensity aerobics • Lower body strengthening as well as interval cardio training • Large focus on balance training

Weights & Mats

FTF Level - B **Avg Size: 20** **55 Plus Centre** **M & W @ 8:40 – 9:40 am** **M & W @ 9:45 – 10:45 am** **F @ 8:45 – 9:45 am** **Kathy Littlefield**	• A class geared towards all moderate to intense fitness levels • Weights and Mats will be used to focus on toning exercises for the whole body • Interval (20 minutes at a time) cardio bursts • Balance will be focused on during this hour workout

Taiji – 48 Weapons/Forms

FTF Level - B **Avg Size: 9** **55 Plus Centre** **T&Th @ 9 – 10 am** **Marguerite Maki**	• Some Tai Chi experience is necessary, as swords will be wielded during this hour-long class • Focus on body awareness and low intensity continuous exercise • This class is not restricted to those with chronic conditions.

Latin Line Dancing – Joy of Line Dancing

FTF Level - B **Avg Size: 12** **55 Plus Centre** **Th @ 10:30 – 11:45 am** **Armin Del Rosario**	• The songs control the speeds of this class. • This class focuses on lower body strength and endurance • Incorporates controlled movements allowing balance to develop

Advanced Core

FTF Level - B **Avg Size: 8 - 10** **55 Plus Centre** **F @ 10 – 11 am** **Kathy Littlefield**	• Some knowledge of core strength training would be beneficial before joining this class • The class progresses from moderate to more intense movements, including the plank and heavier weights • Muscular endurance is important when moving from basic to more advanced movements.

Yoga on the Ball

FTF Level - B **Avg Size: 10 - 12** **55 Plus Centre** **T @ 5 – 6 pm** **KaijaMakinen**	• Focus on breathing and relaxation techniques • Key components include planks, leg lifts, and push ups

Yoga Fit

FTF Level – B **Avg Size: 8** **55 Plus Centre** **W @ 11 – 12 pm** **Kathy Littlefield**	• Incorporates different forms of yoga, Pilates, and fitness • Focus is placed on balance and different movements that help train participants to move more smoothly and concentrate on posture • This is not an aerobics class, but some endurance will be necessary to maintain poses and posture.

Zumba Gold

FTF Level – B **Avg Size: 20** **55 Plus Centre** **Th @ 5:30 – 6:30 pm** **Sat @ 10:30 – 11:30 am** **Karen Gorst-Vigliarolo**	• A low impact, moderate to high intensity cardio workout • Constant lower body movement will help increase strength and power. • Speed will vary in time with the music.

Advancing Taiji

FTF Level – B **Avg Size: 12** **55 Plus Centre** **T & F @ 9 – 10:15 am** **Oliver Reimer**	• Develop coordination and overall flexibility, breathing, and body awareness • The more you practice the moves, the more fluid you will become, and your abilities will improve. • Core strength, power, and speed will help you refine your movements

F.I.T. (Functional Interval Training)

FTF Level – B **Avg Size: 8** **55 Plus Centre** **T & F @ 1:30 – 2:30 pm** **Anne Parr**	• Activities include strengthening, cardio, suspension training, as well as body awareness and balance training • Participants with lower levels of mobility are welcome to participate, and build up your strength and cardio • Accessible to a wide range of participants, including those in wheelchairs or with chronic conditions.

Yoga – All Levels

FTF Level – B **Avg Size: 20** **Canada Games Complex** **F @ 10:10-11:10 am** **IreneDarcis**	• This class contains advanced techniques and complex movements that the participants will learn throughout the sessions

Yoga

FTF Level –C **Avg Size: 15 - 20** **55 Plus Centre** **M & W @ 11 – 12 pm** **T & F @ 10:30 – 11-30 am** **M & W @ 6:30 – 7:30 pm** **Irene Hauta**	• Focus on relaxation and breathing techniques to calm the body and mind. • Zoning in on stretching and strengthening muscle groups and your core stabilizers • This class is beneficial for increasing joint mobility, improving any type of joint problems. • Good for improving overall physical and mental health.

Gear up for Golf

FTF Level –C **Avg Size: 8 - 15** **55 Plus Centre** **T &Th @ 7 – 8 pm** **Anne Parr**	• Work on your balance, strength, agility, and coordination in this fun and interactive fitness class • Gym sticks will be used to maintain body balance, and core stabilizers will be used to prepare for the golfing season • This course will be conducted indoors and outside, weather permitting • Its focus is to provide beneficial exercises to be used before, during, and after a day of golf.

Simply Stretch

FTF Level – C **Avg Size: 20** **55 Plus Centre** **T &Th @ 9:30-10:30 am** **Lisa Geurts**	• Focused on increasing flexibility through light, fluid motion stretching. • Stretch while seated/standing using chairs, balls, and mats. • Work on improving balance • Build strength through controlled repetitive bodyweight movements.

Moving with Sticks

FTF Level – C **Avg Size: 6** **55 Plus Centre** **W @ 12:15-1:15 pm** **Ann Parr**	• Improve your walking endurance as you discover new walking trails around the city. • Use walking poles to help with balance. • Improve your upper body muscular endurance with the help of drum sticks.

Taiji – 8 Forms – For the Beginner

FTF Level – C **Avg Size:** **55 Plus Centre** **M &Th @ 8:50-9:50 am** **Oliver Reimer**	• Build the basic strength, balance, and ability to progress onto more advanced classes. • Build strength through controlled repetitive movements. • Improve lower body flexibility.

Yoga With Uma

FTF Level – C **Avg Size: 15** **Canada Games Complex** **M @ 12 - 1 pm** **Irene Darcis**	• Build strength, flexibility, and balance through yoga movements. • Excellent for people who are new to yoga.

Whole Body Taiji Qigong

FTF Level – C **Avg Size: 10** **55 Plus Centre** **F @ 11:15-12:15 pm** **You LianPeng**	• Focus on developing lower body strength, power, balance, and coordination. • Excellent for those with canes or walkers • Relax the mind/body through repeated slow and controlled movements while focusing on breathing

Core Complete

FTF Level – C **Avg Size: 18** **55 Plus Centre** **F @ 11 -12 pm** **Kathy Littlefield**	• Build strength in the stomach, back, gleuts, hips, and chest through exercises that are conducted on the back, stomach, hands, and knees. • Use light weights to help increase your progression.

Strength in Motion

FTF Level – C **Avg Size: 15-20** **55 Plus Centre** **M & W @ 9:30-10:30 am** **Karen Gorst-Vigliarolo**	• Improve aerobic endurance and strength through seated and standing exercises. • Excellent for those with functional limitations.

Aqua Energizer B

FTF Level –C **Avg Size: 16** **Canada Games Complex** **T &Th @ 10:15 – 11:15 am** **Jessica Eliason**	• Excellent form of low impact exercise performed in the shallow end of the pool. • Improve aerobic endurance through running/walking and jumping exercises. • Build strength with noodle resistance training.

Feldenkrais Method – Awareness Through Movement

FTF Level – D **Avg Size: 7** **55 Plus Centre** **F @12:15-1:15 pm** **T @ 6-7 pm** **Oliver Reimer**	• Improve body awareness and discover your strength through exercise performed standing and lying down. • Focused on comfort • Exercise in dimmed light with eyes closed.

Chair/Seated Yoga

FTF Level – D **Avg Size: 14** **55 Plus Centre** **T @ 11 am - 12 pm** **W @ 10:45 - 11:45 am** **F @ 8:45 - 9:45 am** **KaijaMakinen**	• Excellent for those with functional limitations. • Improve flexibility and strength while seated. • Concentrate on breathing and relaxation. • Transition class from clinical to community.

Meditation for Beginners

FTF Level – D **Avg Size: 6** **55 Plus Centre** **T @ 12:15 - 12:45 pm** **W @ 12 - 12:30pm** **KaijaMakinen**	• Meditate while seated or walking • Explore various types of meditation techniques • Excellent for those with any form of functional limitation.

Taiji Qigong – 6 Forms

FTF Level – D **Avg Size: 15** **55 Plus Centre** **T @ 2:30-3:30pm** **You LianPeng**	• Learn the basic movements of Taiji Qigong. • Perform the 6 forms while seated. • Focus on relaxation and breathing • Excellent for those with low mobility levels, requiring a cane or walker

Sit and Be Fit

FTF Level – D **Avg Size: 8** **Canada Games Complex** **T @ 1:15-2:15 pm** **Debbie Kankanen**	• Excellent starting point to build fitness • Perform exercise while seated. • Build strength and endurance to improve functional fitness. • Excellent for any form of functional limitation.

Aqua Energizer A

FTF Level –D **Avg Size: 30** **Canada Games Complex** **M & W @ 10:15 – 11:15 am** **Jessica Eliason**	• Improve core strength and aerobic endurance with no impact • Exercise in the deep end of the pool with the aid of a floatation belt. • Improve coordination and body awareness.

(Lakehead University Letterhead)

Fitness that Fits Functional Rankings Chart

Chair Stand (Repetitions)

Level	Male	Female
A	20 <	17 <
B	17 - 19	15 - 16
C	14 - 16	12 - 14
D	13 >	11 >

Arm Curl (Repetitions)

Level	Male	Female
A	22 <	20 <
B	19 - 21	17 - 18
C	16 - 18	13 - 16
D	15 >	12 >

2-Minute Step (Repetitions)

Level	Male	Female
A	115 <	107 <
B	101 - 114	91 - 106
C	87 - 100	75 - 90
D	86 >	74 >

Chair Sit-and-Reach (Distance (in))

Level	Male	Female
A	3.8 <	4.8 <
B	0.6 – 3.7	0.7 – 4.7
C	-2.6 – 0.5	-2.0 - 0.6
D	-2.7 >	-2.1 >

Back Scratch (Distance (in))

Level	Male	Female
A	0<	1.6 <
B	-3.2 - -0.1	-0.5 – 1.5
C	-6.6 - -3.3	-3.0 - -0.6
D	-6.7 >	-3.1 >

8-Foot Up-and-Go (Time (sec))

Level	Male	Female
A	3.6>	4.2>
B	4.5 – 3.7	5.0 – 4.3
C	5.6 – 4.6	6.0 – 5.1
D	5.7 <	6.1 <

Appendix B – Consent and Information Forms

Letter to Potential Participants

Email to Fitness Instructors

Cover Letter for Older Adult Participants

Consent Form for Older Adult Participants

(Lakehead University Letterhead)

Letter to Potential Participants

Dear Potential Participant,

The School of Kinesiology at Lakehead University has been conducting a research project entitled "Fitness that Fits". The intent of this project is to develop an individualized tool to help older adults choose a class that is appropriate for their fitness level. For example, this tool may be beneficial for older adults who have not been active for years and are looking to try out a new fitness class. In using this tool an individual can assess his/her fitness level, and based on the assessment results a list of classes that might match his/her fitness level would be provided. The individual could then select a class that is appropriate for them, while not having to worry about the classes being too hard or too advanced.

The Fitness that Fits project is currently starting phase 2. The intent of phase 2 is to validate the tool that was created through phase 1 of the project. In order to carry out this intent, we are seeking older adults who have been active members of a fitness class included within the project. You have been contacted because you were an active member within one of the following classes: Weight & Mats, Taiji – 48 Weapons/Forms, Latin Line Dancing, Advanced Core, Yoga on the Ball, Yoga Fit, Advancing Taiji, Functional Interval Training (F.I.T.), Gear up for Golf, Moving with Sticks, Taiji – 8 Forms, Whole Body Taiji Qigong, Core Complete, Feldenkrais Method, or Taiji Qigong – 6 Forms.

Your participation within this research project would be greatly appreciated. If you wish to participate you can attend 1 of the 5 testing sessions offered at the 55 Plus Centre. Times for the testing sessions are as follows:

- Tuesday, June 18th at 1:00 pm
- Thursday, June 20th at 10:45 am
- Sunday, June 23rd at 1:00 pm
- Wednesday, June 26th at 11:30 am
- Friday, June 28th at 9:00am

Participation in this project would take no longer than an hour of your time. You will be asked to complete a survey that will take approximately 20 minutes. Following completion of Part A of the survey, you will be asked to complete a brief fitness assessment that will take approximately 30 minutes. The fitness assessment includes 6 short tests that include: 30 second chair stand, 30 second arm curl, 2-minute step test, chair sit-and-reach, back scratch, and 8-foot up-and-go. The session will conclude with the completion of Part B of the survey.

Come out and have fun while supporting a good community initiative! If you have any questions or wish to notify the researcher of you participation, feel free to contact Justin Lang.

Regards,

Justin Lang
Master of Science in Kinesiology (c)
jjlang@lakeheadu.ca
(613) 265-5527

Email to Fitness Instructors

Dear ____(Fitness Instructor Name)____,

The School of Kinesiology at Lakehead University is conducting the second phase of the pilot project entitled 'Fitness that Fits'. The intent of this phase of the project is to test the 'Fitness that Fits' Scale that was developed during phase one of the pilot project.

As part of phase two, I will be joining you to participate in your fitness class entitled __(name of class)__ on _____. Following my participation in your class, I will introduce myself and the 'Fitness that Fits' pilot project to your class participants. As part of this phase, I will ask your class participants to complete a survey and a brief functional fitness assessment. Their participation in the Fitness that Fits pilot project will take approximately an hour to complete following your fitness class.

It would be greatly appreciated if you would relay the following message to your class participants ahead of my participation in your class:

"Justin Lang, a student researcher from Lakehead University will be attending our class on _____. He is conducting a research project called "Fitness that Fits". The purpose of the project is to develop a tool that will help older adults select an exercise class that fits their fitness level. As part of the Fitness that Fits project, he will be asking you for an hour of your time following our next exercise class. If you choose to participate, you will be asked to fill out a survey and perform a brief functional fitness assessment."

Thank you for your help,

The Fitness that Fits Research Team

(Lakehead University Letterhead)

Cover Letter for Older Adult Participants

Dear Potential Participant,

Thank you for expressing interest in the 'Fitness that Fits' Project. The project is being conducted by Tracey Larocque (Lead Coordinator), Justin Lang (Student Researcher), and colleagues, all affiliated with the School of Kinesiology at Lakehead University. 'Fitness that Fits' is a project funded by the Ministry of Health Promotion and Sport. The purpose of this study is to develop and test a standardized functional scale that will allow for an older adult to decide on a fitness class that fits him/her functionally, based on his/her ability and fitness level.

You have been asked to volunteer for this Project because you are an older adult participating in a fitness class in Thunder Bay.

Participation in this study will involve you completing a survey that will take approximately 20 minutes of your time to complete. The survey is divided into two separate parts. The intent of 'Part A' of the survey is to determine whether you, the participant, believe that you have chosen an appropriate class, in terms of functional fitness; and whether you believe that the 'Fitness that Fits' Level for your class matches your perception of the class difficulty level. You may decline to respond to any of the survey questions during the study.

You will also be asked to undergo a functional fitness assessment that will take no longer than 30 minutes of your time. The assessment includes six short fitness tests designed to measure your level of flexibility (chair sit and reach & back scratch test), strength (arm curl & chair stand test), aerobic endurance (2-minute step test), and dynamic balance (8-foot up-and-go). After completing the functional fitness assessment, you will be provided with your 'Fitness that Fits' Level. You may decline to participate in any of the six fitness tests at any time during the study.

Following the functional fitness assessment you will be asked to complete 'Part B' of the survey. The intent of the last section is to determine whether you believe that the 'Fitness that Fits' tool is useful for helping older adults select an appropriate fitness class.

There are no foreseeable risks with completing the survey. There are minor risks associated with completing the functional fitness assessment; however, the risks are no more than you would have experienced through participating in your fitness class. The benefits of this study may include an increase in fitness class accessibility. Through this research the community will benefit from an increase in awareness of existing community fitness classes for older adults, in Thunder Bay, and the level of functional fitness required to participate in the classes.

Participation in this study is completely voluntary and you have the right to withdraw at any time during the session. Only the researchers involved with this study will have access to the recorded data and personal information; you will remain anonymous in the written report. Data will be stored in a locked filing cabinet in the School of Kinesiology at Lakehead University for a minimum period of five years. The intent is to have the results of this study published, you will be provided with a copy of the final summary report upon request. We also intend to present our results in a public presentation. Through publication and public presentation your anonymity will be fully maintained.

If you wish to participate in this study, complete the attached consent form. The consent form has been provided to you along with this cover letter. You must return the consent form before participating in this study.

You can contact Justin Lang, or one of the researchers indicated below, if you have any additional questions. You may also contact the Lakehead University Research office at the number below should you wish. Your participation would be appreciated! Thank you for your cooperation.

Yours truly,

Mr. Justin Lang
Student Investigator
(613) 265-5527
jjlang@lakeheadu.ca

Ms. Tracey Larocque
Project Lead Coordinator
(807) 343-8544
tmlarocq@lakeheadu.ca

Dr. Joey Farrell
Dr. Ian Newhouse
Mr. Glen Paterson
Project Researchers

Lakehead University
Office of Research
(807) 343-7749

(Lakehead University Letterhead)

Consent Form for Older Adult Participants

I agree to participate in the study entitled “Fitness that Fits: Project”. The purpose of this study is to develop and test a standardized functional scale that will allow for an older adult to decide on a fitness class that fits him/her functionally, based on his/her ability and fitness level. I have read and understand the information in the cover letter provided with this consent form.

- I understand that I will be asked to fill out a survey that will take approximately 30 minutes of my time.

- I understand that I will also be asked to participate in a functional fitness assessment that will take about 30 minutes to complete.

I understand that participation in this study is completely voluntary and I may withdraw my participation at any time during the study and for any reason. I also understand that my survey responses will be kept strictly confidential. Only the researchers involved in the study will have access to the data. No identifiable characteristics will be used in the final report or in the presentation of the results. The data will be securely stored on a locked computer and/or locked in a cabinet in the School of Kinesiology at Lakehead University for a minimum period of five years. I also recognize that I have access to the final report at the completion of the study, if requested, by contacting Justin Lang.

Name of participant (printed): _____

Signature of Participant: _____

Date: _____

Appendix C – Testing Instrumentation

Fitness that Fits Survey

Data Collection Sheet

(Lakehead University Letterhead)

Fitness That Fits Survey (Part A)

The purpose of this survey is to determine if you, the participant, believe that you have chosen an appropriate class, in terms of functional fitness; and whether you believe that the Fitness that Fits Level for your class matches your perception of the class difficulty.

Functional fitness is defined as "having the physiological capacity to perform normal everyday activities safely and independently without undue fatigue" (Rikli & Jones, 1999).

Name (please print): _____

What is the name of your fitness class? _____

How many months have you participated in this class? _____

Please identify your age category (circle response)

55 – 64	65 – 69	70 – 74	75 – 79	80 – 84	85 – 89	90 +

Please indicate your gender (circle response) M F

For the following questions please circle your response. If the question asks you to further explain your response, you may choose to do so in the space provided below the question.

1. During your class, are you required to perform modified exercises that differ from the rest of the exercise class?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

2. Do you ever feel as though the class intensity level is too low for your level of functional fitness?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

3. Do you ever feel as though the class intensity level is too high for your level of functional fitness?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

4. Do you ever feel that you have to stop to take a break while the rest of the class is still exercising?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

5. Does this class challenge you enough for you to get a good workout during every session?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

6. Is there anything regarding your fitness level that concerns you when participating in this class? Please explain.

_____

_____

_____

_____

_____

_____

7. What are your reasons for joining this fitness class? Please explain.

_____

_____

_____

_____

_____

_____

_____

Please have a look at the Fitness that Fits Scale on the next page.

Fitness That Fits (FTF) Scale

A	*Advanced fitness level exercise classes* Choose an A class if you can withstand: • Complex and continuous movements • Higher degree of coordination and balance • Higher intensity and higher impact • Sustained aerobic endurance (20+ minutes) • Higher level of strength/core strength A classes are recommended for those who are more functionally fit
B	*Moderate fitness level exercise classes* Choose a B class if you can withstand: • Continuous movements • Coordinated movements • Moderate to higher intensity levels • Interval cardio/resistance exercises at low to high intensity B classes require increased body awareness, balance and moderate levels of strength/core strength
C	*Lower fitness level exercise classes* Choose a C class if you need to build fitness levels by engaging in: • Slower and more controlled movements • Shorter interval exercises of low to moderate intensity • Movements of lower degree of coordination and balance • Exercises of lower impact C classes focus on building strength and fitness and working at your own pace with an emphasis on safety
D	*Beginner fitness level exercise classes* Choose a D class if you need to build fitness levels by engaging in: • Activities of very simple movements for any level of fitness • Very low impact exercise (seated, standing optional) • Exercises that require limited strength, balance and flexibility • Activities that focus on self-awareness D classes are used as a starting point to build fitness levels and are safe for those with a wheel chair, walker, or cane or other assistive devices

The remainder of the questions on Part A of the survey will pertain to the Fitness that Fits Scale.

8. Your current fitness class has a Fitness that Fits Level of _____. Please review the detail for this level on the Fitness that Fits Scale.

9. Do you agree with the Fitness that Fits' Level that has been identified for your fitness class?

1	2	3	4	5	6	7
Disagree Strongly	Disagree Moderately	Disagree Slightly	Undecided	Agree Slightly	Agree Moderately	Agree Strongly

   a. Please explain your response in the space provided below.

_____

_____

_____

10. Do you find the Fitness that Fits Scale easy to understand? Yes / No
    a. Please explain your response in the space provided below.

_____

_____

_____

11. Would the Fitness that Fits Scale be an important tool for you in selecting a new fitness class?

1	2	3	4	5	6	7
Very Unimportant	Unimportant	Slightly Unimportant	Undecided	Slightly Important	Important	Very Important

   a. Please explain your response in the space provided below.

_____

_____

_____

12. Is there anything that you would add to the Scale in order to improve it? Yes / No
    Please explain your response in the space provided below.

_____

_____

_____

Please, notify the researcher (Justin Lang) that you have completed 'Part A' of the Survey. Once the whole group has completed this portion of the Survey, as a group, we will perform a brief functional fitness assessment that will take roughly 30 minutes to complete. You will be able to respond to 'Part B' of the Survey following the functional fitness assessment.

Fitness That Fits Survey (Part B)

Name (please print):_____

1. Your Fitness that Fits Level is? _____
2. The Fitness that Fits Level for your class is? _____
3. In knowing your Fitness that Fits Level and the Fitness that Fits Level for your class would this information help you to decide on a future fitness class?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

4. If provided with all the necessary instructions and tools, do you think you would be able to use the Fitness that Fits Scale on your own to find a fitness class?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

5. Do you think the Fitness that Fits Scale would help others select a fitness class that is appropriate for them?

1	2	3	4	5	6	7
Never	Very Rarely	Rarely	Occasionally	Frequently	Very Frequently	Always

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

6. A future objective is to include the Fitness that Fits Scale as part of the Key produced for Thunder Bay residence. Do you agree with including the Scale as a component of the Key?

1	2	3	4	5	6	7
Disagree Strongly	Disagree Moderately	Disagree Slightly	Undecided	Agree Slightly	Agree Moderately	Agree Strongly

   a. Please explain your response in the space provided below.

_____

_____

_____

_____

7. Do you have any other suggestions for ways the Fitness that Fits Scale could be used? Please explain.

_____

_____

_____

8. Do you have any additional comments regarding the Fitness that Fits Scale? Please explain.

_____

_____

_____

_____

Thank you for your time and patience in filling out this questionnaire!

Data Collection Sheet

Date: _____

Name (please print): _____

Test Item	Trial 1	Trial 2	FTF Level
Chair Stand Test		N/A	
Arm Curl Test		N/A	
2-Minute Step Test		N/A	
Chair Sit-and-Reach Test (nearest ½ inch)			
Back Scratch Test (nearest ½ inch)			
8-Foot Up-and-Go Test (Nearest 1/10 second)			

Overall 'Fitness that Fits' Level: _____

Appendix D – Functional Fitness Assessment Information

Senior Fitness Test Protocol

Functional Fitness Assessment Review

Senior Fitness Test Protocol

(Retrieved from http://www.interactivehealthpartner.com/pdf/fft_overview.pdf)

LIST OF EQUIPMENT REQUIRED

The following is a complete list of the equipment you will need to complete the Functional Fitness Test:

1. A Chair Without Arms – preferably a folding chair for greater stability
2. A Stopwatch or Watch with a second hand
3. 5 Pound Weight for women
4. 8 Pound Weight for men
5. Piece of String or Cord about 30” in length
6. Visible, bright color duct tape
7. Counter – to track number of repetitions completed or paper and pencil to track manually
8. Ruler that goes up to 12”
9. Measuring Tape
10. Small Orange Cone

SENIOR FITNESS TESTS

The SFT is comprised of 6 tests that measure the basic activities of daily living. These are listed below:

1. Chair Stand
2. Arm Curl
3. Two Minute Step Test
4. Chair Sit and Reach
5. Back Scratch Test
6. 8-FT Up-and-Go

These are each briefly described on the following pages:

Individual Test Descriptions

1. CHAIR STAND

Purpose and Daily Benefit: The purpose of the Chair Stand is to measure the strength of your lower body. Lower body strength is important for activities such as getting out of a chair, on the bus, out of the car, and rising up from a kneeling position in the house or garden. The strength of your lower body can directly affect the ease with which you perform the activities you do every day.

Equipment: Chair without arms, Stopwatch

Test Steps:
1. Place the chair against a wall where it will be stable.
2. Sit in the middle of the chair with your feet flat on the floor, shoulder width apart, back straight.

3. Cross your arms at the wrist and place them against your chest.
4. The test partner will tell you when to begin and will time you for 30 seconds, using the stopwatch. You will rise up to a full stand and sit again as many times as you can during the 30-second interval.
    a. Each time you stand during the test be sure you come to a full stand.
    b. When you sit, make sure you sit all the way down. Do not just touch your backside to the chair. You must fully sit between each stand.
    c. Do not push off your thighs or off the seat of the chair with your hands to help you stand unless you have to.
    d. Keep your arms against your chest crossed and do not allow the arms to swing up as you rise.
    e. If you are on your way up to stand when time is called you will be given credit for that stand.

Per Protocol Instructions: If the participant used their hands at all to push off in order to stand do not count that rep as a "Per Protocol" stand. Only stands that are done without any assistance by pushing off the seat, off the thighs or with any other assistive devices such as a walker or cane are counted as "Per Protocol" stands. If the participant is unable to do any stands per the protocol, then you may let the individual do the test by pushing off their legs or the chair, or using their walker, but the test will then be scored as "Did Not Follow Protocol." Only "Per Protocol" scores are recorded in the overall group outcomes reports.

2. ARM CURL

Purpose and Daily Benefit: The purpose of the Arm Curl is to measure the strength of your upper body. Upper body strength is important for activities such as carrying laundry, groceries, and luggage. It is also important for picking up grandchildren and giving them a big hug! A lack of upper body strength could keep you from pouring milk from a jug, being able to go grocery shopping for yourself and maintaining your independence.

Equipment: 5 lbs. weight and an 8 lbs. weight, stopwatch and a straight-back chair with no arms. Women will curl a 5 lb. weight in this test and Men will curl an 8 lb. weight for their test. It is extremely important to the accuracy of the test that you use the appropriate weight for men and women in this test.

Test Steps:

1. Your test partner will tell you when to begin and will time you for 30 seconds, using the stopwatch or a watch with a second hand.
2. Do as many curls as you can in the allotted 30-second time period, moving in a controlled manner.
3. Remember to do a Full Curl, squeezing your lower arm against your upper arm at the top of each curl and returning to a straight arm each time. Keep your upper arm still. Do not swing the weight.
4. If you have started raising the weight again and are over halfway up when time is called, you may count that curl!
5. Record the score on the scorecard.

Per Protocol Instructions:
Demonstrate the test slowly and insure proper grip. Allow participant to practice 1-2 repetitions. If the participant cannot lift the appropriate weight for their gender then the participant may do the test without a weight, raising just the weight of their arm. The participant's test will need to be scored as "Did Not Follow Protocol" if they do not use a weight or if they use a lighter weight such as a 3 lb or 1lb weight if they are a woman, or if they are a man and use 5 lbs., 3 lbs. or 1 lb. weight.

3. TWO-MINUTE STEP TEST

Purpose and Daily Benefit: The purpose of the Two-Minute Step Test is to measure your endurance or physical stamina. Endurance is important for activities such as shopping, walking for a distance, and traveling. The more physical stamina you have, the more energy you will have to do the things you enjoy. You will also be able to do more with less fatigue. Your endurance affects your ability to perform many of your daily activities and to maintain your independence.

Equipment: Stop Watch, Measuring Tape, Visible Tape (i.e. masking tape or painter's tape)

Set Up:
Begin by setting the minimum knee or stepping height for each participant. This is at the level even with the midway point between the kneecap and the front hipbone (Iliac crest). It can be determined using a tape measure or by stretching a cord from the middle of the kneecap (patella) to the hipbone. Then you can fold it over and mark this point on the thigh with a piece of tape.

Test Steps:
1. Your test partner will tell you when to begin and will time you for two full minutes using the stopwatch.
2. Begin stepping, being careful to lift your knees to the appropriate height each time so that your knee is level with the tape mark on the wall. Your entire foot must touch the ground on each step to ensure that you are not jogging; you need to "step".
3. Your test partner will count each time you raise your right knee, counting each full stepping cycle. A full step cycle is when both the right and the left foot have lifted off the floor and come back down.
4. Your test partner should alert you at each 30 second interval to allow you to gauge how you feel. If you cannot complete the full 2 minutes that is fine, just complete as much time as you can comfortably complete.
5. If you wish to rest during the test you may stop stepping, rest and then resume the test. The stopwatch will continue to run and you may start stepping again as long as you are still within the two-minute test period.

Per Protocol Instructions:
If the participant cannot do any steps without holding onto a walker or a chair placed to their side then the participant is not following the test protocol. The participant may still complete the test but if they complete the test holding onto a chair or assistive device their score will be saved as "Did Not Follow Protocol."

4. CHAIR SIT-AND-REACH

Purpose and Daily Benefit: The purpose of the Chair Sit and Reach test is to measure your lower body flexibility, specifically your hamstring flexibility. Lower body flexibility is important for preventing lower back pain. It also plays a role in your balance, posture, in fall prevention, and in your gait, or walking. Lower body flexibility is important for maintaining an active, independent lifestyle.

Equipment: Chair, Ruler

Test Steps:
1. Place the chair against a wall so it will be stable.
2. Slide forward in your chair until you are able to straighten one of your legs. The ankle of your straight leg should be flexed at about a 90-degree angle. Your other foot should be flat on the floor.
3. Place one of your hands directly on top of the other so that they are stacked with your fingers extended.
4. Exhale as you bend forward at the hip and try to reach your toes. If the extended leg begins to bend, move back in your chair until the leg is straight.
5. Hold the stretch for at least 2 seconds and Do Not Bounce or jerk as you reach.
6. Take two practice reaches on each leg. Determine which side is more flexible.
You will measure and record only your most flexible side on your scorecard.
7. Be sure you have a stable chair so that the chair will not tip forward as you reach for your toes.
8. After you have completed the practice reaches, your test partner will hold a ruler across the toe of your shoe. The center of the toe of your shoe is considered to be a measurement of “0”.
9. Reach forward toward your toes. Mark your score to the nearest half-inch
10. If you reach past this “0” point at the middle of your toe, you receive a positive score of as many inches as you reach past it, measured to the nearest half-inch
11. If you cannot reach your toes, you receive a negative score of as many inches as you are short of the “0” point at the middle of the toe of your shoe, measured to the nearest half-inch.
12. Try the reach twice and record the better of the two measurements.

Per Protocol Instructions:
This test should be scored as “Followed Protocol” for all trials taken as there really are no modifications for this test.

5. BACK SCRATCH TEST

Purpose and Daily Benefit: The Back Scratch Test is a measure of flexibility of your upper body. Upper body flexibility affects your ability to reach for items that may be high on a shelf, change a light bulb, or do any activity that requires arm and/or shoulder movement. Maintaining flexibility in your upper body will assist you in continuing to live independently.

Equipment: Ruler

Test Steps:
1. Place your left arm straight up in the air above your left shoulder.

2. Bend your left arm at the elbow to reach toward your back, with your fingers extended. Your elbow pointed toward the ceiling.
3. Place your right hand behind your back with your palm out and your fingers extended up.
4. Reach up as far as possible and attempt to touch the fingers of your two hands together. Some people are not able to touch at all, while others' fingers may overlap.
5. Take two practice stretches with each arm, determining which side is more flexible.
You will be measuring and recording only your most flexible side.
6. You are now ready to be measured. Perform the stretch as outlined above. Without shifting your hands, your test partner will position your fingers so that they are pointing toward each other.
7. The distance between the fingertips of one hand and the other is measured to the nearest half-inch. If your fingers overlap, the amount of the overlap will be measured.
8. Fingertips just touching receive a score of "0".
9. If your fingers do not touch, you receive a negative score of the distance between your fingers, measured to the nearest .5 or half inch.
10. You receive a positive score if your fingers overlap, measuring the overlap to the nearest .5 or half inch.
11. If you are able to touch your fingers together, do not grab your fingers together and pull, as this will affect the accuracy of your score.
12. Do the stretch twice, recording the best score and remember to indicate if the score was positive or negative.

Per Protocol Instructions: This test should be scored as "Followed Protocol" for all trials taken as there really are no modifications for this test. If modifications are made in any way, record the score as "Did Not Follow Protocol" and note the modifications in the test comments section.

6. EIGHT-FOOT UP-AND-GO

Purpose and Daily Benefit: The purpose of the Up and Go test is to measure your speed, agility and balance. These are important for activities such as walking through crowds, moving in unfamiliar environments and across changing terrain, and crossing the street before the light changes. The better your balance is, the more confident you will be traveling outside your home and living an active life. Your speed and balance directly affect your self-assurance as you go about your daily activities.

Equipment: Chair, Cone (or other marker), Stopwatch

Test Steps:
1. Sit in the chair with your hands on your thighs, your feet flat on the floor with one foot slightly ahead of the other.
2. Your test partner will hold the stopwatch and stand near the place where you will walk around the marker on the floor.
3. Your test partner will signal, "go" and start the watch. For test accuracy, your test partner must start the watch on the signal, "go." Do not wait to start the watch after the participant has started to move.
4. The test is timed to the nearest tenth (.1) of a second, so it is important to be as accurate as possible when starting and stopping the watch.
5. Upon the signal "go" rise from the chair and walk as quickly as possible out to the marker. You may press off your thighs of the chair when you rise. Do not run. Walk around the outside of the marker and return to your seat as quickly as possible, being sure to be safe in your movements.

6. As soon as you are fully seated again your test partner will stop the watch and record your time to the nearest tenth of a second.
7. If you would like to take a practice test before testing for a score you may. You may then take the test twice, recording your best score.
8. Remember to record the score to the nearest tenth, for example 4.9 seconds or 8.9 seconds.

Per Protocol Instructions:
If the participant does not feel stable enough to do the test without an assistive device then allow the participant to use an assistive device such as a walker or a cane but their score will be recorded as "Did Not Follow Protocol." It is important to try to have the participant record a "Followed Protocol" score if possible since a score of "0" cannot be recorded in this test. Do not worry how slowly a person completes the test "Per Protocol" what is important is to ensure the safety of the participant and try to obtain a "Per Protocol" score. Then if the person would like to do a test to obtain a better score using an assistive device such as their walker, allow them to complete the test with their walker and record their score as "Did Not Follow Protocol."

Functional Fitness Assessment Review

In measuring fitness levels in older adults (aged 55+) it is important to apply the testing within a measurable context. Most fitness tests are developed and validated for younger people, making these tests inappropriate for the majority of older adults, as they are unsafe for those particularly without medical clearance or close monitoring (13). For this reason, a measurable context for older adults would be their ability to perform activities of daily living (ADL). In measuring the capacity to perform ADLs, we are interested in how physically able someone is to perform the routine activities required to successfully take care of one's self. Within the academic literature, the leading term that closely relates to this definition is 'functional fitness'. Functional fitness is a term defined as "having the physiological capacity to perform normal everyday activities safely and independently without undue fatigue" (13). The objective of this article is to critically review the literature pertinent to functional fitness measures in order to determine which pre-existing tool is best applied to testing an older adult population. The secondary purpose is to find a tool that best fits the following parameters: requires minimal equipment, comprehensive, has normative data, is easy and quick to administer, requires minimal testing space, able to assess individuals with chronic conditions, validated/reliable measures, and extensively used in the literature. These parameters have been pre-determined as essential components required for an assessment tool to successfully measure functional fitness quickly and effectively in a large sample size of older adult participants.

Methods

Table 1. Literature Search

Database	Timeline	Number of Hits	Selected Studies *	Key words
Pub Med	2002 – 2012	19	11	Functional Fitness; Measures; Older Adult
Sport Discus	2002 – 2012	5	2	Functional Fitness; Measures; Older Adult
Goggle Scholar	2002 – 2012	353	4	Functional Fitness; Measures; Older Adult

*Selected based on inclusion criteria – measurement tool, older adult participants, peer reviewed, fitness context.

A Pub Med, Sport Discus, and Google Scholar search was restricted to all English articles printed in peer review journals between the years of 2002 and 2012 using key words “functional fitness”, “measures”, and “older adults”. Inclusion criterion were identifiable functional fitness assessment used as a measurement tool, older adult participants, published in a peer review journal, and used in a fitness context. Through the three database searches there was a total of 377 hits, of which 17 articles fit the aforementioned inclusion criteria (see table 1).

Results

As seen in table 2, all studies included older adults aged 55+. The majority of individuals included were healthy older adults, however 7 of the studies included individuals with chronic conditions. The types of chronic conditions include coronary heart disease (CHD), type 2 diabetes, hypertension, osteoarthritis, rheumatoid arthritis, chronic obstructive pulmonary disease (COPD), and minor neurological problems (poor vision, hearing). A total of 2 functional fitness assessments were uncovered through the review; the Fullerton Fitness Test (FFT) and the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD). Most studies utilized the functional fitness assessment as a repeated measure to determine the change in functional fitness being affected by either a fitness or training program. In addition to functional fitness measures, some studies included complementary assessment tests. These tests include questionnaires, strength measures (1 RM tests), aerobic endurance (Bruce protocol), functional capacity measures, quality of life measures, anthropometric, and depression measures.

Table 2. Characteristics of Studies Reviewed

	Participants					
Reference	**Chronic Conditions**	**Average Age**	**Functional Fitness Assessment**	**Design**	**Purpose of study**	**Comments**
Fullerton Fitness Test Studies						
Hand et al., 2012	Healthy	60 years +	Fullerton Fitness Test	Repeated measure	Measure the effects of an exercise training program on functional fitness.	-Also included Health-Related quality of life measurement as assessed by Medical Outcomes Study Short Form – 36 (MOS SF-36)
Bottaro et al., 2006	Healthy	60 – 76 years	Fullerton Fitness Test	Repeated measure	Compare the effects of two difference resistance training	-Also included a 1-RM bench and leg press test.

					program on power output, functional performance, and muscular power	
Kocur et al., 2009	Treated coronary heart disease	Not mentioned	Fullerton Fitness Test	Independent repeated measures	Evaluate the effects of a cardiac rehab program supplemented with Nordic walking or regular walking.	-Treadmill test following the modified Bruce protocol was also used.
Reeder et al., 2008	Type 2 diabetes, hypertension, dyslipidemia, and osteoarthritis	Not mentioned	Fullerton Fitness Test	Repeated measure	Effectiveness of class-based and home-based exercise programs in older adults with chronic conditions	-The Physical Performance Test and the Physical Activity Scale for the Elderly were also used to assess.
Lobo et al., 2011	Not mentioned	Not mentioned	Fullerton Fitness Test	Repeated measures	Determine the effect of aerobic training, strength training, and education program on physical fitness	-Habitual physical activity (MTI Actigraph), Health related quality of life (MOS SF-36), and BMI were also measured.
Suomi et al., 2003	Osteoarthritis and rheumatoid arthritis	60 – 79 years	Functional Fitness Tool for adults older than 60	Independent repeated measures	Determine the effects of a aqua/on-land exercise program on functional fitness and ADL measures	-ADLs were evaluated by using a modified version of the Functional Capacity Evaluation.
Wilkin et al., 2010	Not mentioned	78.36± 5.60 years	Fullerton Fitness Test	Single measure	To determine the correlation between functional fitness and several other health-related variables.	-Health-related questionnaires were also used.
Alexander et al., 2008	Chronic obstructive pulmonary disease	Not mentioned	Fullerton Fitness Test	Repeated measures	The effects of a strength-training enhanced program and a traditional pulmonary rehab program on the functional fitness	-1-RM incline bench press and leg press were also performed.
Matsuda et al., 2012	2 or more chronic conditions	55 + years	3 items from Fullerton Fitness Test	Repeated measures	Effect of a home-based exercise program on physical function	-the self-rated abilities for health practices questionnaire was also used
Wiacek et al., 2008	Not mentioned	65 + years	Fullerton Fitness Test	Single measure	Aimed to analyze the socio-economic influence on functional fitness	n/a
Shideler et al., 2006	Healthy	66 – 91 years	Fullerton Fitness Test	Repeated measures	Compare the functional fitness ability between different types of exercise programs	n/a
Garatachea et al., 2008	Health sedentary	60 – 98 years	Fullerton Fitness Test	Repeated measures	To investigate whether measures of physical activity and physical function are related to feelings of well being.	-Also used measures of PA (YPAS), IADL (BI), and well being (EBP).
Sierpowska et al., 2006	Healthy	Mean age 63.5 years	Fullerton Fitness Test	Single measure	Assess the functional fitness capability of active seniors participating in yoga and swimming exercises.	-Measures BMI, WHR, and percent body fat.
Pepin et al., 2004	Cardiac Rehab Patients (CHD)	68.9 ± 6.3 years	Fullerton Fitness Test	Single measure	Assess the feasibility of using an objective, comprehensive test battery to describe the	

					functional fitness of older coronary patients.	

American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) Studies

Godard et al., 2008	Not mentioned	72 ± 7.66 years; 73 ± 7.87 years	AAHPERD	Repeated measures	Examine the relationship between the CHAMPS questionnaire and the AAHPERD	-Also included the Community Healthy Activties Model Program for Seniors (CHAMPS)
Wood et al., 2003	Osteoarthritis and neurological problems (poor vision, hearing)	73.2 ± 8.1 years	AAHPERD	Single test	To study the relation between age and heart rate variability during the AAHPERD	-Used ECG to monitor heart rate variability during AAHPERD
Simons et al., 2006	Healthy	83.5 ± 6.2 years	AAHPERD	Repeated measures	Assess the effects of resistance training and walking exercise on measures of functional fitness	-1-RM test for both upper and lower body.

Discussion

In the development of this review, a total of two functional fitness tools have been uncovered: the Fullerton Fitness Test (FFT) and the AmericanAlliance for Health, Physical Education, Recreation and Dance (AAHPERD). Through this discussion, the secondary purpose of this review will be achieved. In an attempt to determine which tool best fits the predetermine parameters (minimal equipment, comprehensive, normative data, easy/quick to administer, chronic conditions, minimal space, validated/reliable measures, extensively used in the literature), each tool will be critically analyzed.

The American Alliance for Health, Physical Education, Recreation and Dance

The American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) was originally developed in 1990 by Osness, W. H. and colleagues. The tool was developed as an effective field-test to determine the functional fitness of older adults aged 60 years plus. Through establishing functional fitness levels, the test offers age and gender related norms which serves as effective feedback for participants. The AAHPERD test can be conducted by personnel not necessarily trained for clinical responsibilities. This allows for the test to be more accessible to the public. It is also quickly and easily administered allowing for many older adults to be measured in a short amount of time. The equipment that is required for testing is very common and normally available. The parameters measured through this test include endurance, flexibility, strength, balance, and coordination. Endurance is measured via an 880 yard (800 meters) continuous walk. Equipment required for this activity, include a stop watch, measuring tape,

and cones. This walk can be conducted in an open field where a track can be measured out and outlined with cones. Participants are instructed to walk the track as quickly as possible with minimal rest time. Approximate times for completion range from 5 to 14 minutes.

The strength component of the AAHPERD is measured through a seated arm curl test. Equipment required for this test includes a 4lbs weight (female), an 8 lbs weight (male), and a chair with no arm support. Participants are instructed to hold the weight in their dominant hand and perform as many repetitions in 30 seconds while seated. One repetition is counted as full extension of the arm, followed by full flexion. Approximate number of repetitions range from 0 – 40.

The coordination parameter is measured through a soda pop hand dexterity test. Equipment required for the test include a chair, table, masking tape, and 3 full 350 ml soda cans. On the table, the tester sets up six squares along a 30 inch strip of masking tape, 5 inches apart. Participants use their dominant hand. For right handed participants, soda pop cans are placed on squares 1, 3, and 5. The test begins with the participant placing their right hand on the 1st can with thumb up. On the start signal, the participant places the can upside down onto adjacent squares 2, 4, and 6. When completed, the participant proceeds by replacing the cans back to their original position. On the return trip, the cans must be grasped with thumbs down. The entire procedure is done twice and counted as one trial. The objective is to run through the test as fast as possible. The stop watch is only stopped once the last can has been placed back to its original position. Two practice trials and two test trials are given, with the fastest time of the two test trials recorded. Approximate completion time ranges from 8 to 25 seconds.

Flexibility is measured through a seated trunk/leg flexion test. The only equipment required for the test is a yardstick. Participants are instructed to sit on the floor with legs fully extended and roughly 12 inches apart. The yard stick is placed between the participants legs with heels at the 6 inch mark. Participants are required to place one hand on top of the other and reach as far as possible along the yard stick. 4 trials are given, with the highest score recorded. Approximate range of scores is 5 to 30 inches.

Balance is measured via the 8 foot up and go test. The equipment required for this test is a chair and two cones. Cones are placed 6’ to the side and 5’ behind on both sides of the chair. Participants are instructed to sit in the chair, and on the go signal get up and walk around the cone on the right. Once returned to the chair, they have to sit down and raise their feet a ½ inch off the floor. They then immediately proceed by walking around the cone on the left followed by re-sitting on the chair. This course is repeated twice. Participants undergo 2 trails, with the fasted time recorded. Approximate range of scores is between 15 and 35 seconds.

Anthropometric measures are also recorded for all participants. A standing height is measured as well as body weight. Through these measurements BMI is calculated and recorded.

AAHPERD Ability to Meet Parameters

The equipment required to conduct the AAHPERD include an 800 meter track/field, a stop watch, 2 sets of dumbbells, a chair, soda pop cans, masking tape, 30 cm ruler, a measuring tape, weigh scale, and a cone. This all adds up to 11 pieces of equipment (see table 3). In order to carry out the aerobic fitness aspect of the test an 800 or 400 meter track is required. This in addition to a small to midsized room is the space required to conduct this test. It takes roughly 45 minutes to fully administer this test to one participant. Normative data is available for those aged 60 to 90 years old. Although the AAHPERD is fairly well round, it is missing a measure for lower body strength which is a major flaw in this test. Lower body strength is a main requirement for measuring functional fitness. The test has been carried out on those with osteoarthritis and neurological problems (22). The test is also proven both valid and reliable (10, 15). Lastly, through this review of literature a total of 3 studies were found that use the AAHPERD.

The Fullerton Fitness Test

The Fullerton Fitness Test (FFT) was developed in 1999 by Rikli and Jones. The intent of the test battery was to provide a means of assessing the key physiologic parameters that support functional mobility in older adults. The FFT is a field test that is meant to be quick and easy to assess participants. It also does not require trained professionals to administer the test, making it much more accessible to the public. Also, improving accessibility to the test is the equipment used, which is very common and easy to find. The test measures 9 physiological parameters which include muscular strength/endurance, aerobic endurance, flexibility, motor power, speed, agility, balance, and body composition. The FFT also provides normative data for individuals aged 55 plus, which aids in providing feedback to participants.

Much like the AAHPERD, the FFT also includes the arm curl test, the 8-ft up-and-go, and anthropometric measures which include weight and height in order to calculate body mass index (BMI). In addition to these tests, the FFT also measures lower body strength, upper and lower body flexibility, and aerobic fitness differentiating itself from the AAHPERD.

In order to measure lower body strength, a 30-second chair stand test is used. Equipment required for this test is a chair without arm rests and a stop watch. Participants are required to start in the seated position, with arms crossed at wrist and held at the chest. On the “go” signal, the participant stands, counting as one repetition, and proceeds to sit back in the start position. Participants are required to conduct as many repetitions as possible in 30 seconds.

Upper body flexibility is measured through a back scratch test. Equipment required for this test is a 30 cm ruler. The participant begins this test in the standing position, and places the dominant hand over shoulders with fingers outstretched downwards as far as possible towards the middle of the back. The other hand is placed with palm outstretched upwards to try and hold the fingers of the opposite hand.

Lower body flexibility is measured through a chair sit and reach teach. Equipment required for this includes a chair and a 30 cm ruler. Participants are asked to sit in the chair with one foot resting on the ground, while the other is completely outstretched resting with the heel on the ground and foot flexed at a 90 degree angle. Hands are placed one over the other and the participant is instructed to leans over to try and touch the out stretch foot's toes. The stretch is maintained for 2-seconds, in which time the tester measures how far the hands are from the toes.

Aerobic fitness is measured via a 6 minute walk test or a 2-minute step-in-place test. In this case we will focus on the step test as it requires less room. Equipment required for this test is a measuring tape and a wall. The researcher measures the participant's length between the patella and iliac crest. Half this distance is marked onto a wall, and used as a stepping guide. Participants are required to complete as many stepping repetitions as possible in 2 minutes while elevating the knee to the indicated spot on the wall.

The Fullerton Fitness Test's Ability to Meet Parameters

The equipment required for the FFT includes a chair, a stop watch, a cone, 2 sets of dumbbells, a weigh scale, measuring tape, and a 30 cm ruler. This adds up to 8 pieces of common equipment (see table 3). The space required to carry out this test is a small to mid size room. The FFT is well rounded, as it measures multiple components of functional fitness. The FFT takes roughly 30 minutes to fully administer to a participant (11). Normative data is available for the test ranging from ages of 55 to 90 years old. The test has been carried out on participants with Coronary Heart Disease (CHD) (6), chronic obstructive pulmonary disease (COPD) (1), osteo and rheumatoid arthritis (19), metabolic syndrome (12), and those with 2 or more unmentioned chronic conditions (8). The FFT has been proven both valid and reliable (13, 9). Lastly, through this review of literature, a total of 14 studies used the FFT as its primary measure of functional fitness.

Table 3. Parameters of tools

	FFT	AAHPERD
Pieces of Equipment	8	9
Comprehensive	Well rounded	Does not include a measure of lower body strength
Normative Data	Available	Available
Approx time to admin	30 minutes	45 minutes
Chronic Conditions	CHD, 2 or more chronic conditions, COPD, osteo/rheumatoid, metabolic syndrome	Osteoarthritis and neurological problems
Space Required	Small/mid size room	800 meter track + small/mid size room
Valid/Reliable	Both reliable and valid	Both reliable and valid
Extent of use: # of studies	14	3

Conclusion

In conducting a critical review of literature to determine the best measurement tool to assess 'functional fitness' we were provided with two assessment tools, being: the Fullerton Fitness Test (FFT) and the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD). Through analyzing which of the two assessment tools best fits our predetermined parameters (minimal equipment, comprehensive, normative data, easy/quick to administer, chronic conditions, minimal space, validated/reliable measures, extensively used in the literature) we were provided with some interesting results. In 6 of the 8 parameter categories, the FFT produces better results. Of the remaining two categories the FFT and AAHPERD produce equivalent results (see table 3). Through these results, it is justifiable to conclude that the FFT would be a superior tool for the purposes of assessing 'functional fitness' within a large sample size of older adult participants.

References

1. Alexander JL, Phillips WT, Wagner CL. The effect of strength training on functional fitness in older patients with chronic lung disease enrolled in pulmonary rehabilitation. *Rehab Nurs* 2008; 33 (3): 91 – 97.
2. Bottaro M, Machado SN, Nogueira W, Scales R, Veloso J. Effect of high versus low-velocity resistance training on muscular fitness and functional performance in older men. *Eur J ApplPhysiol* 2007; 99: 257 – 264.

3. Garatachea N, Molinero O, Martinez-Garcia R, Jimenez-Jimenez R, Gonzalez-Gallego J, Marquez S. Feelings of well being in elderly people: Relationship to physical activity and physical function. *Arch Gero and Geri* 2009; 48: 306 – 312.
4. Godard MP, Standley CM. Relationship between CHAMPS physical activity questionnaire and functional fitness outcomes in older adults. *Act, Ad & Age* 2008; 31 (1): 19 – 40.
5. Hand BD, Cavanaugh S, Forbes W, Govern J, Cress ME. Changes in health-related quality of life and functional fitness with exercise training in older adults who attend senior centers. *Act, Ad & Age* 2012; 36 (1): 29 – 54.
6. Kocur P, Deskur-Smielecka E, Wilk M, Dylewicz P. Effect of Nordic walking training on exercise capacity and fitness in men participating in early, short-term inpatient cardiac rehabilitation after an acute coronary syndrome – A controlled trial. *ClinRehabil* 2009; 23: 995 – 1004.
7. Lobo A, Carvalho J, Santos P. Comparison of functional fitness in elderlies with reference values by Rikli and Jones and after one-year of health intervention programs. *J Spor Med and Phys Fit* 2011; 51: 111 -113.
8. Matsuda PN, Shumway-Cook A, Ciol MA. The effects of a home-based exercise program on physical function in frail older adults. *J GeriatrPhysTher* 2010; 33: 78 – 84.
9. Miotto JM, Chodzko-Zajko WJ, Reich JL, Supler MM. Reliability and validity of the Fullerton Functional Fitness Test: An independent replication study. *J Age Phys Act* 1999; 7: 339 – 353.
10. Osness WH, Adrian M, Clark B, Hoeger W, Raab D, Wiswell R. Functional fitness assessment for adults over 60 years: A field based assessment. *The American Alliance for Health, Physical Education, Recreation and Dance* 1990.
11. Pepin V, Phillips WT, Swan PD. Functional fitness assessment of older cardiac rehabilitation patients. *J Cardpul Rehab* 2004; 24: 34 – 37.
12. Reeder BA, Chad KE, Harrison EL, Ashworth NL, Sheppard SM, Fisher KL, Bruner BG, Quinn BG, Pahwa P, Hossain AM. Saskatoon in motion: Class-versus home-based exercise intervention for older adults with chronic health conditions. *JPAH* 2008; 5: 74 – 87.
13. Rikli RE, Jones CJ. Development and validation of a functional fitness test for community-residing older adults. *J Age Phys Act* 1999; 7: 129 – 161.
14. Rozanska-Kirschke A, Kocur P, Wilk M, Dylewicz P. The Fullerton Test as an index of fitness in the elderly. *Med Rehab* 2006; 10 (2): 9 – 16.
15. Shaulis D, Golding LA, Tandy RD. Reliability of the AAHPERD functional fitness assessment across multiple practice sessions in older men and women. *J Age Phys Act* 1994; 2: 273 – 279.
16. Shideler A, Swartz M, Michel J, Schulte J. Comparison of functional fitness training model & the traditional resistance training model for the development of functional fitness in older adults. *Pro GRASP* 2007; 23: 21 – 22.

17. Sierpowska A, Ciechanowicz I, Cywinska-Wasilewska G. Functional fitness assessment among elderly women (60+) participating in yoga or swimming exercises. *Stu PhysCul and Tour* 2006; 13: 81 – 83.
18. Simons R, Andel R. The effects of resistance training and walking on functional fitness in advanced old age. *J Aging Health* 2006; 18: 91 – 105.
19. Suomi R, Collier D. Effects of arthritis exercise programs on functional fitness and perceived activities of daily living measures in older adults with arthritis. *Arch Phys Med Rehabil* 2003; 84: 1589 – 1594.
20. Wiacek M, Hagner W. The history and economic impact on the functional fitness of elderly in the south-eastern region of Poland: A comparison with US citizens. *Arch Gero and Ger* 2008; 46: 221 – 226.
21. Wilkin LD, Haddock BL. Health-related variables and functional fitness among older adults. *Int J Aging Hum Dev* 2010; 70 (2): 107 – 118.
22. Wood RH, Hondzinski JM, Lee MC. Evidence of an association among age-related changes in physical, psychomotor and autonomic function. *Age and Ageing* 2003; 32: 415 – 421.