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Effects of Bingocize® on Quality of Life, Fall Risk, and Health Knowledge in Community-Dwelling Older Adults

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EFFECTS OF BINGOCIZE® ON QUALITY OF LIFE, FALL RISK, AND HEALTH KNOWLEDGE IN COMMUNITY-DWELLING OLDER ADULTS.

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EFFECTS OF BINGOCIZE® ON QUALITY OF LIFE, FALL RISK, AND HEALTH KNOWLEDGE IN COMMUNITY-DWELLING OLDER ADULTS

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Quality of life (QOL) is an important aspects of overall well-being in older adults. QOL is associated with functional, physical, and psychological health; all of which can be improved with increased physical activity. A high fall risk is associated with low physical function and QOL. One in four older adults experiences a fall each year, making it necessary to focus public health interventions towards decreasing fall risk and improving QOL in older adults. Bingocize® is a health promotion program designed to promote health, health knowledge, physical activity, and social engagement among older adults. The purpose of this study was to determine the effects of the new version of Bingocize® on QOL and fall risk in community-dwelling older adults (N=36; mean age 73.63 ± 6.97). Participants were clustered and randomly assigned to (a) experimental (n=19; participating in Bingocize® program, which included the bingo game, exercise, and health education) or (b) control (n=17; only played bingo). Each group completed a 12-week intervention that consisted of two 45-60 minute sessions per week. Pre and post data assessments included the TUG, 30-second chair stand, 4-staged balance, handgrip strength, WHOQOL-BREF, PANAS, and a health knowledge quiz. A mixed design analysis of variance (ANOVA) was used to compare intervention effects. There were no significant interactions for any of the variables, with the exception of positive affect (PA) ($F(1,34) = 5.66$, $p = 0.02$, $\eta_p^2 = 0.15$, power = 0.64) and handgrip strength ($F(1,34) = 8.31$, $p = 0.007$, $\eta_p^2 = 0.196$, power = 0.80).. There was also a significant main effect for

time for health knowledge. Post hoc analysis using independent samples t-tests were conducted on PA (t (33) = 2.39, p = 0.023, two-tailed) and handgrip strength (t (34) = 2.85, p = 0.007, two-tailed). Participating in the Bingocize® health promotion program can produce a meaningful and detectable change in handgrip strength and PA in community-dwelling older adults.

Chapter 1: Introduction

Psychological well-being and quality of life (QOL) are important aspects of overall well-being in older adults. QOL is a term that is defined by an individual's "overall sense of well-being, including aspects of happiness and satisfaction with life as a whole" (CDC, 2000, p.5). QOL is associated with functional, physical, and psychological health (Zubritsky et al., 2013). All of these factors can be improved with increased physical activity. High QOL is found among older adults with high physical function, little pain, few diseases, and those able to independently perform activities of daily living (ADL) (Chen, Hicks, & While, 2013; Naylor et al., 2016). For public health professionals focused on aging populations, the ultimate goal is to design and implement physical activity interventions to improve components of QOL, such as psychological health, functional health, and physical health.

Physical activity may positively impact *psychological health* in older adults (Parker, Strath, and Swartz, 2008). An effective way to determine an individual's psychological health is to measure positive and negative affect. "Positive Affect (PA) reflects the extent to which a person feels enthusiastic, active, and alert" (Watson, Clark, & Tellegen, 1988). Having a high PA is associated with pleasurable engagements and overall positive well-being. A low PA is associated with unhappiness and lethargy (Watson et al. 1988). "Negative Affect (NA) is a general dimension of subjective distress and unpleasant engagement that subsumes a variety of adverse mood states, including anger, contempt, disgust, guilt, fear, and nervousness, with low NA being a state of calmness and serenity" (Watson et al. 1988, p.1). Having a low PA and a high NA is associated with depression and anxiety (Watson et al. 1988).

Psychological health, and therefore QOL, could also be affected by *fear of falling* in older adults (Hoang, Jullamate, Piphatvanitcha, & Rosenberg, 2017). Fear of falling is defined as "a lasting concern about falling that can lead to an individual avoiding activities that he/she remains capable of performing" (Tinetti & Powell, 1993, p.36). According to the Centers for Disease Control and Prevention (CDC), 2.8 million older adults over the age of 65 are treated in emergency departments due to fall injuries (CDC, 2016a). The direct medical cost for these fall related injuries is $50 billion annually. Not only are fall related injuries associated with substantial economic costs, but the injuries can also limit independence and performance of ADLs. Fall risk in older adults is multi-factorial, but major factors include decreased lower body strength, balance and gait problems, and lack of knowledge of fall risk (CDC, 2016a). Older adults with poor balance tend to have a greater fear of falling and avoid performing activities that may increase their chance of having a fall, including exercising (Hoang et al., 2017). Performing exercises that improve balance may lessen older adults' fear of falling, which led the CDC to create a compendium of effective fall prevention interventions for this population.

The compendium includes interventions that help decrease fall risk by improving strength and balance through exercise. The CDC also developed the "Stopping Elderly Accidents, Deaths, and Injuries" (STEADI) program to assess fall risk in older adults. Each patient is categorized as low, moderate, or at high risk for falling. STEADI recommends educating patients about fall risk, as well as providing strength and balance exercises for patients based on their level of fall risk. Most of the programs the CDC provides in the compendium incorporate STEADI recommended physical exercises;

however, most do not include information to educate older adults about fall risks, which is an important component in reducing fall risk in older adults. The education portion of a falls prevention program can further decrease an older adult's risk for falling, potentially leading to improvements in the older adult's overall QOL. However, while there are multiple fall prevention interventions listed in the compendium, *adherence* and retention to these programs can be an issue for older adults.

While the benefits of physical activity on psychological health and QOL are widely known, low adherence rates to exercise programs create a barrier preventing the older adults from gaining the benefits that exercise has to offer. Loss of interest and boredom are possible explanations for low adherence to exercise programs (Garcia, Felix Navarro, Schoene, Smith, & Pisan, 2012). Enjoyable exercise interventions are needed to attract older adults to participate and keep their interest long enough to gain the physical and psychological benefits of exercise. Recently, *Exergames* (exercising using video/virtual reality games) have been introduced as an enjoyable way to improve adherence to exercise programs (Garcia et al., 2012). While these exergames are helpful in improving adherence rates for health promotion programs, the games tend to be costly and usually are played individually, not structured as a group activity. Some older adult facilities and older adults with low socioeconomic status (SES) do not have the funds to provide the equipment needed (laptops, internet, tablets, etc.) for these exergames.

SES is a major factor in the overall health and well-being of older adults. A recent study found that low SES populations experience improvements in psychological and physiological health status after participating in a long-term exercise training program (Choi, Chang, & Kong, 2015). This is important because older adults with a moderate to

low SES typically report having a lower QOL compared to older adults with a high SES (Bielderman et al., 2015). In addition, SES is positively associated with participation in regular exercise; meaning low SES individuals are participating in less regular exercise than high SES individuals (Choi, Chang, & Kong, 2015). As a result, public health interventions are needed in low SES populations, specifically in community senior centers located in rural areas because these areas tend to have a low SES population, and therefore a less physically active population.

The population of adults age 65 and over is rapidly increasing, due to people living longer and the aging baby boomer generation (CDC, 2013). It is predicted by the year 2050, 89 million people will be 65 years or older, which is double the population of older adults in 2010 (CDC, 2013). Because older adults are such a large part of the world's population, it is necessary to focus public health interventions towards older adults. The fact that one out of every four older adults experiences a fall each year shows the magnitude of the problem of falls among this population (CDC, 2016a). Therefore, there is a need for effective evidence-based interventions to reduce or eliminate falls for low SES older adults and underserved older adult facilities.

Bingocize® is an evidence-based intervention shown to improve gait, decrease fall risk, and increase patient engagement, all of which improve the overall QOL in older adults (Crandall, Fairman, & Anderson, 2015; Falls et al., In Press). Bingocize® provides a fun and social environment, while also promoting a healthy lifestyle. This creates an environment conductive to change, which makes it easier for the older adults to be more socially engaged and learn healthy habits. These changes can be explained by the Social Ecological Model (SEM), which states that behaviors shape and are shaped by the social

environment (Golden, McLeroy, Green, Earp, & Lieberman, 2015). Bingocize® is an interactive combination of the game of Bingo, physical activity, and health education. A recent investigation using Bingocize® for older adults showed an adherence rate of over 90% (Shake et al., In Press), which provides solid evidence that participating older adults continued to be engaged in this program. Currently, there are two versions of Bingocize®: (1) the original Bingocize® game, which involves the game of Bingo and physical exercises for the participants to perform, and (2) the mobile application (app), which involves the game of Bingo, physical exercises, and health knowledge questions that are presented throughout the game. The mobile app of Bingocize® focuses on general strength and balance exercises, as well as general health knowledge. Bingocize® is an evidence-based intervention that has been shown to improve multiple factors in older adults; however, this specific Bingocize® version requires internet connection and access to technology, such as laptops or tablets, which may not be feasible for some community senior centers with limited resources for health promotional programs. The *new* and third version of Bingocize® is similar to the app version; however, it is paper-based, which eliminates the need to purchase tablets and internet accessibility. This new version focuses primarily on falls prevention, which includes specific exercises recommended by the CDC to decrease fall risk, including balance, lower body strength, and core exercises (CDC, 2015). Health information is presented throughout the game to improve participants' knowledge of fall risk, ways to decrease fall risk, and QOL. This new version targets the factors necessary for a successful public health intervention, which has the potential to improve the QOL of participating older adults.

Purpose

The purpose of this study was to determine the effects of the new version of Bingocize® on fall risk and QOL in community-dwelling older adults.

Definition of Terms

- *Community-dwelling older adults* - Older adults who live in a community on their own instead of living and getting cared for in a nursing home (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010).
- *Fall* - An unexpected event in which the participant comes to rest on the ground, floor, or lower level (CDC, 2016a).
- *Fall Risk* - An individual that is at risk of falling in not aided by mobility aids (walkers, canes, etc.) or without the assistance of another individual (CDC, 2016a).
- *Positive Affect* - Refers to the extent to which an individual subjectively experiences positive moods such as joy, interest, and alertness (Watson et al., 1988).
- *Negative Affect* - A personality variable that involves the experience of negative emotions and poor self-concept (Watson et al., 1988).
- *Fall Efficacy Scale* - Measures the level of fear of falling in an individual (Tinetti, Richman, & Powell, 1990).
- *Exergame* - An interactive way to exercise that involves video games or virtual reality games (Garcia et al., 2012).

- *Psychological Well-being* - Refers to how individuals evaluate their own lives (Ryff, 1989).
- *Quality of Life* - the standard of health, comfort, and happiness experienced by an individual (Tinetti et al., 1990).
- *Sarcopenia* - The loss of muscle tissue resulting from the aging process (Crandall, Fairman, & Anderson, 2015).
- *Senior Center* - A community center that connects older adults in the community and provides services to help the older adults stay healthy and independent (NCOA, 2018).

Delimitations

1. The participants could not begin any additional exercise programs during the experiment.
2. Participants were either male or female, over the age of 60.
3. Participants were generally inactive (less than 150 minutes of moderate intensity exercise per week), but also independent enough to perform the specific strength and balance exercises.
4. Participants were not diagnosed with any neurological disorders.

Limitations

1. Other factors, including vitamin D deficiency, vision problems, side effects from medications, and poor footwear, might cause participants to experience a fall during the study. This would cause an increase in fall risk.

2. Pre and post assessments must be conducted at the facility, and not in a controlled environment.

Assumptions

1. The participants will honestly answer the questions provided during the pre and post-assessments.
2. The participants will perform the exercise tests to the best of their abilities.

Hypothesis

- Hypothesis$_0$: Bingocize® will have no effect on fall risk QOL, positive affect, negative affect, fear of falling, fall risk, muscular strength, nor health knowledge compared to the control group.
- Hypothesis$_1$: The participants in the experimental group will show significant increases in QOL compared to the control group.
- Hypothesis$_2$: The participants in the experimental group will show significant decreases in negative affect and significant increases in positive affect compared to the control group.
- Hypothesis$_3$: The participants in the experimental group will show significant decreases in fear of falling compared to the control group.
- Hypothesis$_4$: Participants will show significant decreases in fall risk compared to the control group.
- Hypothesis$_5$: The participants in the experimental group will show significant increases in muscular strength compared to the control group.

- Hypothesis$_6$: The experimental group will show significant improvements in knowledge of falls prevention in older adults compared to the control group.

Chapter 2: Literature Review

The goal of any health promotion program is to improve the quality of life of the target population. For older adults, falls and having a high fall risk are major factors that can reduce quality of life (Jung, 2008). The following literature review discusses quality of life, fall risk, and other factors that influence these.

Quality of Life

QOL encompasses multiple factors, including functional health, physical health, and emotional health (Zubritsky et al., 2013). One longitudinal study on QOL and older adults found that QOL tends to decrease over time; however, on average, QOL was found to be high among participants with higher physical function, higher emotional well-being ratings, fewer depressive symptoms, and greater emotional or informational support (Naylor et al., 2016). All of these factors were found to improve with physical activity, which is the why it is necessary to have evidence-based exercise interventions for older adults, and preferably ones that also provide the emotional and informational support needed to help improve the QOL.

Broekhuizen et al. (2016) measured QOL before and after introducing physically inactive participants to an internet-based exercise intervention. Activity level was measured using a triaxial accelerometer worn on the wrist. There was a significant increase in QOL after the three-month physical activity intervention ($P = 0.03$). It was also noted that there was an even larger increase in QOL amongst the participants that also reached their specific self-reported physical activity goal set at the beginning of the study. There was also a strong association between the increase in minutes spent in

moderate-to-vigorous exercise and the increase in QOL (Broekhuizen et al., 2016). This study provides further evidence supporting the importance of physical activity in improving QOL.

Positive Affect, Negative Affect, and Psychological Well-being

Mental health is a great concern for older adults because it is an important component of overall quality of life and can often affect physical health (Parker, Strath, & Swartz, 2008). A study examining the effects of physical exercise on mental health in older adults showed a higher volume of exercise was related to a lower negative affect, higher positive affect, and higher satisfaction with life. Parker et al. (2008) also found the amount of time that an older adult engages in physical activity can effectively determine their mental health status (Parker et al., 2008).

Psychological disorders negatively affecting an individual's psychological well-being and QOL are often treated with either medication, psychotherapy, or both. However, less than 50% of these individuals respond to these types of treatments (Gerber, Holsboer-Trachsler, Puhse, & Brand, 2016). A study on individuals suffering from Major Depressive disorder who were resistant to psychotherapy and medication treatment showed an improvement in depressive symptoms after a 12-week exercise program. The 12-week exercise program consisted of moderate intensity exercise (30-45 minutes.), performed five times per week. The control group did not perform the exercise program and none of the participants showed improvements in depressive symptoms (Mota-Pereira et al., 2011). Improvements in depressive symptoms were associated with a decrease in negative affect, increase in positive affect, and an increase in psychological

well-being. Based on the results of these studies, exercise interventions have the potential to positively influence psychological and general well-being.

Fear of Falling

Overcoming the psychological barrier of fear of falling is important for the success of older adult exercise programs (Bruce et al. 2002). Fear of falling is more common in older adults with poor balance, history of falls, poor health perception, and poor independency with activities of daily living (ADLs) (Hoang, Jullamate, Piphatvanitcha, & Rosenberg, 2016). Individuals experiencing a fall in the past have a higher fear of falling (40-73%) (Jung, 2008); however, fear of falling is also an issue for older adults who haven't fallen in the past. A study of 4,031 community-dwelling older adults found that fear of falling in these individuals, experienced a fall in the past (1,315 participants) and no fall in the past (2,716 participants), caused the participants to avoid certain activities that may lead to a fall (Zijlstra et al., 2007). Avoiding activities due to fear of falling results in reduced QOL because some of these activities may be activities the older adults enjoyed in the past. Along with decreased QOL, fear of falling was associated with reduced ability to perform ADLs and physical activity (Jung, 2008). Decreased physical activity increases sarcopenia, which further decreases performance of ADLs and increases the risk of falling. Leach et al. (2018) showed older adults at an increased risk of falling, or that had fallen in the past, tend to have an altered gait, specifically with locomotor trajectory (i.e. turning). Older adults with a high fall risk or a past fall were shown to have a lower quality and quantity of turns while walking; which means the older adults would take longer to turn, use more steps to turn, and would turn less often than those that were at a lower risk for falling (Leach, Mellone, Palumbo,

Bandinelli, & Chiari, 2018). This altered gait pattern could be explained by fear of falling because the individuals are altering movements to avoid a fall. Safely altering locomotor trajectory is an important skill that older adults need to remain independent to perform (Leach et al., 2018). If the older adult avoids turning or walking due to fear of falling, then the functional performance of that individual will most likely decrease, resulting in a further increase in fall risk.

Interventions for older adults that focus on improving balance, physical function, and walking speeds decreased the fear of falling (Jung, 2008). Also, interventions combining physical activity and educational components were more effective at decreasing fear of falling than interventions involving physical activity alone (Jung, 2008). Sattin et al. (2005) examined the effects of fear of falling on older adults using two different interventions: an exercise intervention involving tai chi and an educational-only intervention. The education involved teaching the participants about falls, methods to reduce falls, exercise, nutrition, mental health, and pharmacological management. Using the *Falls Efficacy scale* (FES), fear of falling significantly decreased in both the exercise and educational groups after the 48-week intervention. However, the exercise group showed greater decreases in fear of falling compared to the education-only group, which further confirms the importance of both exercise and falls education for reducing fear of falling in older adults (Sattin, Easley, Wolf, Chen, & Kutner, 2005). The FES uses self-efficacy to measure an individual's fear of falling , which could explain why the exercise group showed greater decreases in fear of falling than the education-only group (Tinetti et al., 1990). Self-efficacy refers to "an individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments" (APA, 2018,

p.1). So, someone with low self-efficacy will tend to avoid difficult tasks because that individual will often doubt their capabilities. Participants in the exercise group showed greater improvements in self-efficacy fear of falling compared to the education-only group because completing these exercises improved the individuals' confidence in performing difficult tasks. Another possible reason this group had greater improvements in fear of falling self-efficacy could from the social aspect of participating in Tai-Chi as a group. Individuals with low self-efficacy can improve in self-efficacy by observing similar individuals succeed in a difficult task (APA, 2018).

Fall Risk

Falls are the leading cause of fatal and nonfatal injuries in adults over the age of 65 (Bergen, Stevens, Burns, 2016). One in three older adults will experience a fall each year, and those that have fallen are two to three times more likely to have another fall (CDC, 2015). Older adults are generally less physically active than younger adults, and those that are physically active generally participate in low intensity activities (Chodzko-Zajko, et. al. 2009). This decrease in physical activity contributes to the decline in muscle mass due to primary aging (sarcopenia), balance, flexibility, and muscular strength, leading to the loss of functional performance (Chodzko-Zajko, et. al. 2009). Decreases in functional performance in older adults may increase fall risk (Crandall, et.al. 2015).

Falls and fall-related injuries are the biggest predictors of loss of independence in older adults and admission into a long-term care facility ("Prevention of falls and fall-related injuries in community-dwelling seniors: an evidence-based analysis," 2008). Risk factors that contribute to falls in older adults include lower body weakness, vitamin D deficiency, difficulties with walking, balance issues, use of certain sedative or

antidepressant medications, vision problems, foot pain, poor footwear, and hazardous environmental factors around the person's house (uneven steps, multiple throw rugs, no handrails in the bathroom or along stairs, and poor lighting) (CDC, 2016a). The fall risk of a patient increases as the number of risk factors increase (CDC, 2016a). Based on the STEADI algorithm, there are three categories of fall risk; low risk, moderate risk, and high risk (CDC, 2016b). Patients are placed in one of the three categories based on the answers to the STEADI questions that the patient provides, as well as how the patients perform on the physical tests. The questions include if the patient has fallen within a year, how many times they have fallen, if they were injured from any of the falls, if they feel unsteady when standing or walking, and if they have any worries about falling. The physical tests include the Timed Up and Go (TUG), 30-second chair stand, and the 4-Stage Balance test. For each of the categories, it is recommended patients should be provided with strength and balance exercises, along with information about falls and fall risk (CDC, 2016b).

Fall Risk Interventions

Multifactorial fall prevention interventions are more beneficial in reducing fall risk than simply providing the patient with information about falls (Logan et al. 2010). The CDC's compendium of effective fall risk prevention programs contains twelve multifactorial fall interventions. All of these interventions emphasis the importance of muscular strength and balance exercises; however, only five of these recommended interventions incorporate a health education component. The CDC recommends educating older adults about the risk factors that increase fall risk and ways to prevent falls, in addition to balance and lower body strengthening exercises (CDC, 2016b).

There is a large amount of scientific evidence supporting the physical, cognitive, and social-related benefits of exercise (Newman et al., 2006; Parker et al., 2008). However, the percentage of older adults adhering to physical activity programs tends to be low, even with the known benefits of physical activity. Recently, Exergames (exercising using video/virtual reality games) have been introduced as a way to improve adherence to exercise programs (Crandall et al., 2015). A meta-analysis on exergames found older adults are highly motivated to participate in this type of exercise program (Harris, Rantalainen, Muthalib, Johnson, & Teo, 2015). Exergames are also beneficial in improving muscular strength and balance. A recent pilot study found significant improvements among the intervention group in lower body strength and balance after an 8-week exergame intervention compared to a control group that did not participate in the exergame (Kim, Son, Ko, & Yoon, 2013). The experimental group in this investigation adhered to the intervention 100% compared to 71.4% for the control group (Kim et al., 2013). Exergames may address low adherence to fall risk prevention programs; however, exergames are limited to older adult facilities that have financial resources to purchase these games, which tend to be expensive due to the technology needed to play. Even with the costly prices of some exergames, the benefits of the increased adherence rates may represent the increased enjoyment these participants had with this type of intervention. Having the participants willing to participant in these interventions allows them to gain the benefits that physical exercise has to offer, which may cause an overall increase in the QOL of the participants.

Muscle Strength

As a result of reduced strength in diseased or deconditioned individuals, older adults with reduced muscle strength have a higher risk of falls and mortality (Newman et al., 2006). Newman et al. (2006) compared the relationship of muscle mass and strength with mortality in older adults. Both hand-grip (using an isometric dynamometry) and quadriceps strength (using an isokinetic dynamometry) were measured, along with muscle size. After assessing total mortality over a six-year period, both hand-grip and quadriceps strength were predictive of mortality (Newman et al., 2006). Interventions to increase lean mass in participants have the potential to improve strength, which may help reduce fall risk and overall mortality (Frontera, Meredith, O'Reilly, Knuttgen, & Evans, 1988; Newman et al., 2006).

Leong et al. (2015) assessed the prognostic importance of the grip strength measurements (using a Jamar® dynamometer) among participants from 17 different countries, all of which differed culturally and economically. The participants were assessed over a median four-year period for any changes in health, hospital stays, or death. The investigators found HGS strongly predicted all-cause mortality, cardiovascular mortality, non-cardiovascular mortality, myocardial infarction, and stroke (Leong et al., 2015). These findings are consistent with other studies highlighting the importance of developing evidence- based interventions capable of improving muscular strength in older adults.

Bingocize®

Bingocize® is an exergame with the potential to address low adherence rates to physical activity programs among older adults. Bingocize® is an interactive game of bingo that older adults enjoy, but also combines physical activity, health education, and social interaction. During a typical Bingocize® session (refer to Appendix B), the leader will first instruct the participants to perform approximately five warm-up exercises (refer to Appendix A). Then, the leader will call out three bingo numbers, similar to a typical bingo game (Dieckmann, Glavin, Hartvigsen Gronholm Jepsen, & Krage, 2016). After calling out the numbers, the leader will then instruct the participants to perform three exercises. Once the exercises are completed, the leader will call three more numbers. Then the leader will read out a specific health knowledge question for the participants to answer. The participants are provided a binder with the specific questions to read and answer (refer to appendix D). Once the participants have answered the question, the leader will then read the correct answer (the questions and answers are provided to the leader. Refer to Appendix E) and the participants will mark the correct answer beside the question. These steps are repeated until there is a bingo winner (refer to the Dieckmann et at., 2016 study for instructions on how to play and win in a typical bingo game). Once there is a winner, the game starts over, and this continues for 45-60 minutes (mins). While many exergames include a physical activity component, most do not involve any health education or social interaction. Crandall et al. (In Press) found an adherence rate to Bingocize® of over 90% in a group of community-dwelling older adults. In addition, the researchers found significant improvements in upper body and lower body strength in the experimental group (bingo with exercise and health knowledge information) compared to

the control group (bingo with only health knowledge information). Another Bingocize® study concluded "participating in a 10-week multicomponent exercise intervention that included bingo as a program enhancer may significantly improve measures of functional fitness," as well as strength and balance (Crandall, et al. 2015). In another investigation, Crandall and Steenbergen (2015) administered the Bingocize® program to community-dwelling older adults and found significant improvements in 7 out of 8 measures of functional performance compared to a control group (Crandall & Steenbergen, 2015). These findings provide support that Bingocize® can positively impact the functional fitness of older adults, while also providing them with a social exercise intervention. Based on the knowledge from the review of literature and the results from previous Bingocize® studies, the new Bingocize® version may show a significant increase in QOL and positive affect, while decreasing negative affect and fear of falling. It is expected that the new Bingocize® will decrease fall risk and increase muscular strength. Therefore, the purpose of this study was to determine the effectiveness of a new version of Bingocize® focused on improving QOL, positive and negative affect levels, fear of falling, fall risk, muscular strength, and health knowledge about falls in community-dwelling older adults.

Chapter 3: Methods

Participants

Community-dwelling older adults (both male and female), over the age of 60, were recruited for this investigation. The age of 60 was the inclusion criteria because all previous Bingocize® research for older adults have used 60 as the minimum age to participant. Participants that were interested in participating had to meet the following criteria to participate: a minimum score of 17 on the telephone mini-mental status exam (T-MMSE) (Tombaugh & McIntyre, 1992) (refer to Appendix H), be able to perform the specific exercises during the intervention, be physically inactive (less than 150 minutes of moderate intensity exercise per week), and not be diagnosed with any neurological disorders. Participants that met the criteria were instructed not to participate in any extra physical activities while participating in the experiment. Participants were recruited from four different community senior centers in Kentucky and Tennessee. The Activities Director at the specific community senior center was in charge of recruiting the participants and leading the Bingocize® program. An a priori power analysis revealed a total sample size of 40 was needed to detect significant differences (power = .8; beta = .2; alpha = .05; effect (η_p^2)= .40). Random assignment of participants to condition was not feasible; instead, groups of participants from each of the four community senior centers were randomly assigned by a coin toss to one of the two conditions (i.e., cluster randomization).

Prior to the first data collection, a Western Kentucky University (WKU) Kinesiology graduate student trained older adult facility staff to be Bingocize® leaders at the specific community senior center where the intervention would take place. The one-

time training lasted around an hour and included education and exercise demonstrations, how to lead a session, and safety precautions.

If the participants attended at least 80% of the sessions and completed the baseline and post-intervention data collections, they were compensated $40 each. If the participants did not attend at least 80% of the sessions, then that participant's data was not used. An additional compensation for the participants included winning prizes that cost around $1. The leaders were compensated with $100 each at the conclusion of the study.

Design

Prior to study initiation, approval was obtained from WKU's Institutional Review Board (IRB). This study was a 14-week, cluster randomized control trial (RCT). This RCT was an experimental, between-groups, repeated measures (pre/post) design. All groups used the specific Bingocize® bingo cards (refer to Appendix C). Each of the sites were randomly assigned to one of two conditions: (a) experimental (played Bingocize® while also participating in specific exercises and answering health education questions related to fall risk and QOL) and (b) control (only played the Bingocize® game and did not participate in either the exercises nor the health education).

During the first week of the experiment, trained WKU Kinesiology graduate students traveled to each community senior center for baseline assessments. Participants completed an informed consent (refer to Appendix F), health questionnaire form (refer to Appendix N), and learned important information about the experiment (the purpose of the experiment, what the participants would be expected to do, and risks and benefits of

participating). A Physician Release Form (refer to Appendix G) was required to ensure participants could safely complete the Bingocize® intervention, as well as the baseline and post intervention assessments.

During the first week of the study, the participants filled out paperwork (all filled out by hand, not electronically) and performed physical tests (refer to Appendix I for the data collection sheet), which will all be listed and described below. Baseline and post-assessments assessed the participants fall risk, positive affect, negative affect, fall efficacy, muscular strength, QOL, and health knowledge about fall risk, fall prevention, and QOL in older adults. The intervention began on week 2 and lasted 12 weeks (week 2 through 13), with the post-assessments completed during week 14.

Quality of Life Assessment

The World Health Organization quality of life assessment (WHOQOL-BREF) was administered to determine the QOL of each participant (refer to Appendix L). The WHOQOL-BREF is a valid and reliable (Cronbach alpha = 0.80) way to test QOL in individuals ("Development of the World Health Organization WHOQOL-BREF quality of life assessment. The WHOQOL Group," 1998). The assessment involves questions that are scored based on the four domains related to QOL: physical health, psychological health, social relationships, and environment ("Development of the World Health Organization WHOQOL-BREF quality of life assessment. The WHOQOL Group," 1998). However, the environment domain should not change due to this intervention, so the questions from this domain was excluded.

Positive and Negative Affect Scale

The Positive and Negative Affect Scale (PANAS) was administered before and after the Bingocize® intervention to determine the levels of positive and negative affect and overall satisfaction of each participant (refer to Appendix J). The PANAS is a 20-item scale that measures the frequency of various positive and negative affect emotions, and is used as a valid and reliable (Cronbach's alpha = 0.86-0.9 for PA and 0.84-0.87 for NA) predictor of psychological well-being (Watson et al., 1988). High NA and low PA is associated with depressive symptoms, anxiety, and decreased psychological well-being (Watson et al., 1988).

Falls Efficacy Scale (FES)

The FES was administered to determine participants' fear of falling (refer to Appendix K). Tanetti et al. developed a scale to determine an individual's fear of falling, called the Fall Efficacy Scale (FES) (Tinetti et al., 1990). The FES is a valid (r = 0.84) and reliable (r = 0.71) way to measure a patient's self-confidence in avoiding a fall based on a 10-question scale (Legters, 2002). The items include different activities that are typically performed on a daily basis. The participant rates how confident they are in performing each activity without falling, using a 10-point Likert scale (1 being very confident and 10 being not confident at all). The scores that the patient records for each activity is totaled to get the individual's FES score. Higher FES scores indicate a greater fear of falling (Tinetti et al., 1990).

Health Education Quiz

The participants were also administered a health education quiz before and after the intervention (refer to Appendix M). The quiz consisted of thirty multiple-choice questions and focused on fall risk, fall prevention, and QOL in older adults. The quiz was constructed by a Western Kentucky University graduate student. Content validity was established because the questions were developed from information provided by the CDC, American Society on Aging (ASA), and the World Health Organization (WHO) (ASA, 2016; CDC, 2016a; CDC, 2016b; WHO, 2016). The quiz was reliable ($\alpha = 0.73$).

Physical and Functional Tests

Blood pressure, weight, and height were recorded. The TUG, 30-second chair stand, and the 4-stage balance test were administered according the CDC protocols (CDC, 2016b). Participants performed three trails of the Timed Up and Go. All three trails were recorded, and the average of the three trails was used. Muscular strength was determined by measuring handgrip and knee extension strength. Maximal isometric handgrip and knee extension strength of the self-reported dominant side was measured. Handgrip strength was measured in a seated position with elbow at 90^{o} flexion using a JAMAR handgrip dynamometer. Participants performed three maximal isometric contractions approximately three seconds in duration, and the peak isometric handgrip strength was recorded. Isometric knee extension was measured using a validated and reliable handheld dynamometer (Hoogan Health MicroFET 2). Participants sat in a padded chair with knees bent at 90^{o} flexion. The tester then applied the dynamometer on the anterior aspect of the shin of the self-reported dominant leg, immediately proximal to the ankle. In order to provide adequate resistance during testing, the tester's arm was

supported by a wall to ensure the exercise was performed isometrically. Participants performed three maximal knee extensions approximately three seconds in duration.

The Intervention

Experimental Group:

The facilities were provided with all of the Bingocize® materials, including specific Bingocize® cards (refer to Appendix C) and chips to place on the card. Those in the experimental group were also provided with exercise equipment, consisting of resistance bands and balance pads, as well as a binder for each participant consisting of health education questions that were addressed throughout the game (refer to Appendix D). The information for these questions were derived from the same sources as the quiz questions (CDC, ASA, and WHO). The Bingocize® leader was provided a binder with step-by-step instructions on how to lead each specific Bingocize® session instructions (refer to Appendix B), as well as the health knowledge questions and answers (refer to Appendix E). During the intervention, each experimental group played Bingocize® two times per week, with each session lasting 45-60 minutes. The program only occurred two times per week due to the different events already scheduled with the senior community centers.

The experimental groups played bingo, using the specific Bingocize® game cards, answered health education questions, and performed exercises. The specific Bingocize® game cards were modified from the original bingo game to ensure every participant had the number for each roll (refer to Appendix C). This allowed every participant to participate in every roll. The numbers on the card were mixed randomly. The leader had

instructions explaining when to call a number, when to ask a health education question, or when to instruct the participants to perform certain exercises (refer to Appendix B). The exercises were provided and focused primarily on balance, lower body strengthening, and core strengthening (refer to Appendix A). The Health Knowledge questions focused on falls, fall risk, and QOL. The questions were developed by a WKU graduate student. Based on a readability test, the health knowledge questions were at a seventh grade reading level. Each participant was provided with a packet of multiple-choice questions posed throughout the 12-week intervention (refer to Appendix D). The instructor informed the participants when to answer each question during each session. The instructor read the participants the question number, read the question aloud, read the answer choices aloud, allowed the participants time to circle an answer choice, and then read out the correct answer. A blank space was provided beside each question for the participants to record the correct answer once announced. The questions were randomly assigned to a training session, with each question repeated twice throughout the 12-week intervention. Each week, the exercise repetitions and sets gradually increased. It was instructed that the participants remain at a moderate intensity during the exercises because the CDC recommends older adults exercise at this intensity (CDC, 2016c). The Borg Rating of Perceived Exertion Scale (RPE) was used to help the participants perform the exercises at a moderate intensity (refer to Appendix O) (CDC, 2015a). Participant adherence was determined by an attendance sheet. The Bingocize® leader was in charge of recording when each participant was present or not present for each session.

Control Group:

The control group played a modified version of bingo, using the specific Bingocize® game provided, without exercise or health knowledge information. The leader was instructed to call out a number and allow the participants time to place a chip on that number before calling out the next number (similar to a typical bingo game) (Dieckmann, Glavin, Hartvigsen Gronholm Jepsen, & Krage, 2016). No exercises were performed, nor was any health knowledge information provided. Participant adherence was monitored using an attendance sheet. The Bingocize® leader recorded attendance for each session.

Chapter 4: Results

A mixed design analysis of variance (ANOVA) was used to compare intervention effects for the experimental and control groups. A one-way ANOVA was used to compare adherence rates, height, weight, BMI, and age. Chi square tests were used to analyze gender, race, yearly income, and highest level of education. All data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 23.0). Statistical significance was set at $p < 0.5$.

Shown in Figure 1, 44 participants met the criteria for the investigation; 43 completed the pre-testing; and 36 participants (n=19, experimental; n=17, control) completed the pre-testing, the Bingocize® intervention, and the post-testing. The average age for all participants was 73.63 ± 6.97 years. No significant differences in baseline characteristics were observed between conditions (Table 1). The overall average adherence rate during the intervention was 95.16% (93.86% for experimental group and 96.53% for control group). Based on a one-way ANOVA, no significant differences in adherence rates were observed between both conditions. Participant attrition (7 participants) was associated with injuries not related to the Bingocize® program, scheduling conflicts, and death.

Results from the mixed-ANOVA for intervention effects on the variables are presented in Table 2. There were no significant interactions for any of the variables, with the exception of PA and handgrip strength. There was also a significant main effect for time for health knowledge. Results from the leg extension strength assessment were excluded due to mechanical errors of the handheld dynamotor.

Figure 1.
Participant Flow Diagram

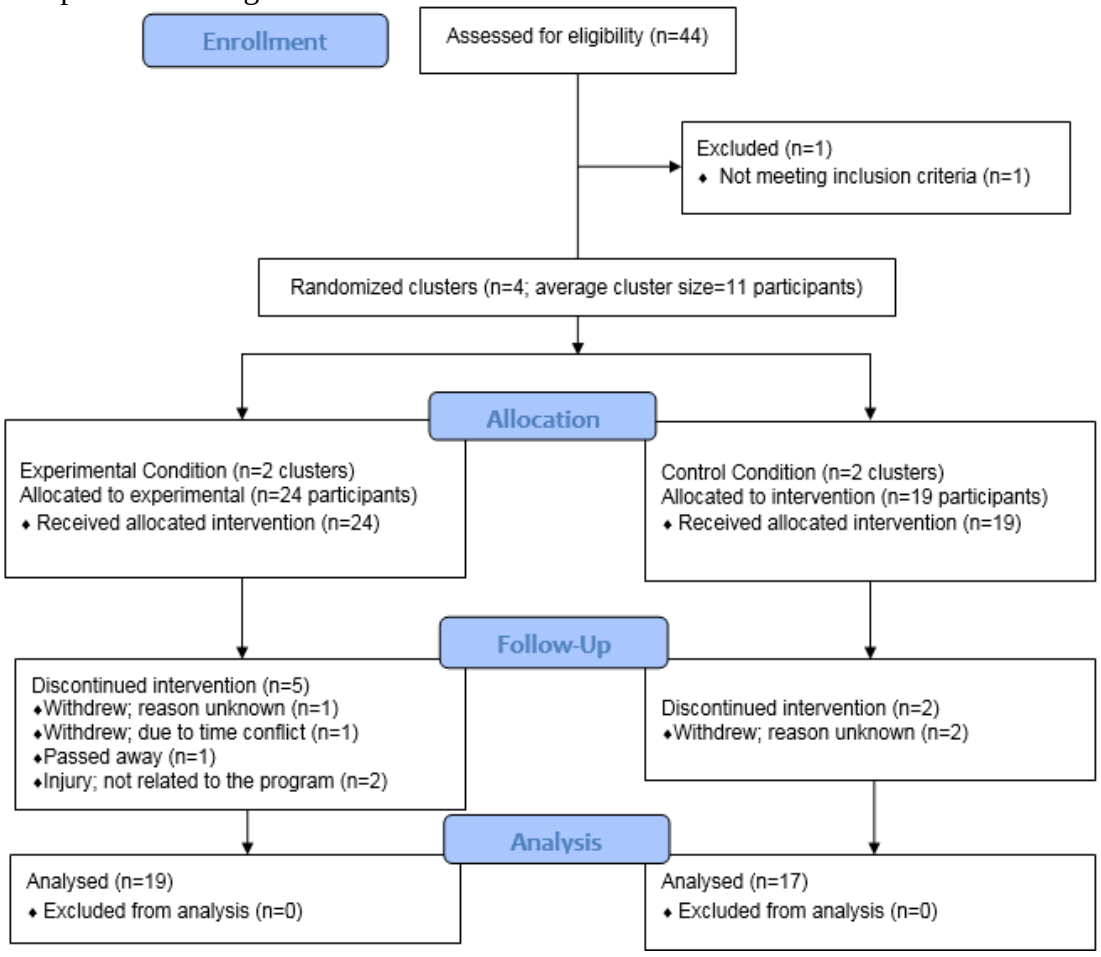

Table 1.
Participant Demographics

Characteristics	Experimental Group *(n=19)*	Control Group *(n=17)*	P value
Sex [a]			
Male	2	2	0.56
Female	17	15	
Age (years) [b]	70.89 ± 4.92	76.88 ± 7.77	0.18
Race/Ethnicity [a]			
Caucasian	11	14	
African-American	8	2	0.12
American Indian	0	0	
Hispanic	0	1	
Other	0	0	
Highest Level of Education [a]			
Less than high school	2	1	
High School	9	14	0.17
Associate's Degree	5	2	
Bachelor's Degree	1	0	
Graduate Degree	2	0	
Yearly Income [a]			
Less than $10,000	4	7	
$10,000-$15,000	9	8	
$15,000-$20,000	2	1	
$20,000-$25,000	0	1	0.20
$25,000-$35,000	2	0	
$35,000-$50,000	1	0	
$50,000-$75,000	1	0	
Greater than $75,000	0	0	
Anthropometrics			
Height (cm) [b]	163.49 ± 7.69	160.15 ± 7.72	0.30
Mass (kg) [b]	82.87 ± 19.09	87.06 ± 25.14	0.59
BMI [b]	31.17 ± 7.34	33.94 ± 8.33	0.38

Data are represented as mean ± standard deviation
BMI Body Mass Index
[a] Chi Square was used to analyze; [b] one-way ANOVA used to analyze
*$P < 0.05$, statistically significant

Table 2.
Intervention Effects

Variables	Control (*n=17*)		Experimental (*n=19*)		Group x Time		
	Baseline	**Post-Intervention**	**Baseline**	**Post-Intervention**	$F(1,34)$	P	η_p^2
QOL 1	28.90 ± 9.89	23.86 ± 6.01	30.21 ± 9.24	25.59 ± 7.71	0.02	0.89	0.001
QOL 2	43.14 ± 9.63	38.24 ± 7.70	42.26 ± 6.71	37.87 ± 10.81	0.04	0.85	0.001
QOL 3	109.64 ± 26.32	103.76 ± 18.03	105.41 ± 24.52	109.50 ± 23.97	1.61	0.21	0.05
Positive Affect	34.71 ± 7.29	31.35 ± 9.91	36.83 ± 7.40	39.00 ± 9.00	5.66	0.02*	0.15
Negative Affect	13.35 ± 3.72	14.29 ± 4.96	15.17 ± 7.01	17.83 ± 11.50	0.50	0.49	0.02
FES	20.06 ± 17.10	22.94 ± 25.23	18.39 ± 12.74	26.83 ± 25.10	0.44	0.51	0.01
Average TUG	14.06 ± 6.76	14.32 ± 10.57	10.48 ± 4.13	10.41 ± 5.11	0.068	0.80	0.002
Chair Stand	9.94 ± 4.93	9.59 ± 4.37	8.79 ± 5.00	9.42 ± 5.19	0.66	0.42	0.02
4 Stage Balance	2.71 ± 0.85	2.65 ± 1.06	3.05 ± 1.03	3.37 ± 1.01	2.03	0.16	0.06
Handgrip	21.00 ± 3.82	20.06 ± 5.75	23.71 ± 6.92	26.05 ± 6.75	8.31	0.007*	0.196
Health Knowledge [a]	19.41 ± 4.11	20.82 ± 3.11	18.68 ± 5.08	21.84 ± 4.73	0.011	0.92	0.00

QOL 1 Quality of Life Score (Domain 1: Physical Health)
QOL 2 Quality of Life Score (Domain 2: Psychological)
QOL 3 Quality of Life Score (Domain 3: Social Relationships)
FES Falls Efficacy Scale
Average TUG Average score of all 3 Timed Up and Go trials
[a] Number correct out of 30 questions
*$P < 0.05$, statistically significant interaction

Quality of Life (QOL) Assessment

Results from the mixed-ANOVA for intervention effects on the WHOQOL-BREF assessment showed no significant main effects or interactions for either of the three domains: (1) physical health, (2) psychological, and (3) social relationships.

Positive Affect (PA) and Negative Affect (NA)

Results from the mixed-ANOVA for intervention effect on the PANAS are displayed in Table 2. There was no statistically significant main effects or interaction for

NA. There was a significant interaction (group x time) for PA, with a large effect, in the experimental group compared to the control group (F (1,34) = 5.66, p = 0.02, η_p^2 = 0.15, power = 0.64); however, there were no significant main effects for PA. Post hoc analyses using pair sample t-tests were conducted on PA for both conditions, with neither the experimental group (*t* (17) = -1.36, *p* = 0.19, two-tailed) nor the control group (*t* (16) = 1.99, *p* = 0.64, two-tailed) showing significant changes over time. Post hoc analysis using independent sample t-test were also conducted on PA for baseline and post-intervention. There was not a significant difference between the control condition and experimental condition at baseline (*t* (41) = 0.96, *p* = 0.35, two-tailed), however, there was a significant difference in PA between the two conditions for the post-intervention (*t* (33) = 2.39, *p* = 0.02, two-tailed).

Fear of Falling

Results from the mixed-ANOVA for intervention effect on the PANAS showed no significant main effects or interactions for the FES.

Health Knowledge

Results from the mixed-ANOVA for intervention effects showed a significant main effect for time for health knowledge (F (1,34) = 22.70, p < 0.000, η_p^2 = 0.40, power = 0.996); however, there was not a statistically significant main effect of group nor interaction (group x time) for health knowledge. Post hoc analyses using pair sample t-tests were conducted on health knowledge for both conditions, with the experimental group (*t* (18) = -4.15, *p* = 0.001, two-tailed) and control group (*t* (16) = -2.57, *p* = 0.02, two-tailed) both showing significant increases in health knowledge over time.

Physical and Functional Tests

Results from the mixed-ANOVA for intervention effects showed no statistically significant effects or interactions for the TUG, 4-stage balance, and chair stand tests. There was a statistically significant interaction (group x time) in handgrip strength, with a large effect, in the experimental group compared to the control group ($F(1,34) = 8.31$, $p = 0.007$, $\eta_p^2 = 0.196$, power = 0.80); however, there were no statistically significant main effects for handgrip strength. Post hoc analyses using paired sample t-tests were conducted on handgrip strength for both conditions, with the experimental group showing a significant increase in handgrip strength over time ($t(18) = -2.86$, $p = 0.01$, two-tailed) and the control group not showing any significant changes over time ($t(16) = 1.20$, $p = 0.25$, two-tailed).

Chapter 5: Discussion

The purpose of this investigation was to determine the effects of Bingocize® on QOL and fall risk in community-dwelling older adults. There were no statistically significant differences between the experimental and control groups for QOL, positive affect, negative affect, fear of falling, TUG, 30-second chair stand, 4-stage balance test, nor health knowledge. However, the experimental group experienced statistically significant improvements in PA and handgrip strength compared to controls.

Quality of life is an important aspect of the overall well-being in older adults and unlike other researchers, we did not find significant improvements in QOL after participating in Bingocize®. Broekhuizen et al. (2016) found improvements in older adults' QOL after participating in a 3-month, moderate-to-vigorous exercise program. The intensity of exercise could explain why Broekhuizen et al. (2016), and other researchers, found significant improvements in QOL, while this study did not. American College of Sports Medicine (ACSM) recommends older adults participant in 150 minutes (mins) of moderate-intensity activity per week, or 60 mins of vigorous intensity activity per week (ACSM, 2018). More specifically, it is suggested that older adults participate in at least 30 mins of moderate-intensity aerobic exercise per day, 3-5 days per week. In addition, older adults should add resistance, balance, and flexibility training at least two times per week (Zaleski et al., 2016). For this study, the participants in the experimental group were instructed to perform the exercises at a moderate intensity, due to CDC recommendations (CDC, 2016c). Intensity was monitored using the Borg RPE scale. Assuming this was the only exercise the participants engaged in each week (it was instructed to the participants to not be involved in any additional structured exercise

programs during the intervention), the participants were only participating in ~90 mins of moderate intensity activity per week (one Bingocize® session lasts around 45 mins, and occurred two times per week). Because the participants were not reaching the minimum amount of activity recommend by ACSM, the intensity of the exercises should have been increased in order to possibly see some improvements in not only the QOL variables, but for all of the variables that were measured. The socioeconomic status (SES) of the participants could also explain the lack of significant improvements in QOL for either group. A study by Bielderman et al. (2015) observed the relationship between SES and QOL of 193 community-dwelling older adults, and found an indirect relationship between SES and QOL; meaning SES does not directly affect QOL, however, it does affect the social and psychological functioning of the individual, which then affects QOL. In addition, older adults with a moderate to low SES reported a lower QOL, regardless of the individual's level of physical function. The majority of the participants in the current study (77.78%) are considered below the 2017 poverty line, which could have negatively impacted improvements in QOL, even if the participant's physical function improved from the intervention (United States Census Bureau, 2017).

While there were no *statistically* significant results for either of the three QOL domains measured, the control group showed a decreasing trend from baseline to post-intervention for mean social relationships domain (domain 3) scores, while the average domain 3 score showed an increasing trend from baseline to post-intervention in the experimental group (Table 2). The social relationships domain represents the personal relationships and social support in an individual's life (WHO, 2016). Some research suggests that increasing social support is an important factor in increasing exercise

motivation (Kamimura et al., 2014). Since the experimental group was the only condition to see an increase in domain 3, the added exercise and health knowledge portion of the program could be the reason for the increased social support and relationships. This increase could further motivate the individual to continue the exercise program, which could also explain the high adherence rate in the experimental group (93.86%).

Positive affect has been shown to be an "independent predictor of both mental QOL and physical QOL" (Stauber et al., 2013, p. 5). Even though there were no statistically significant improvements for QOL, the experimental group showed a significant increase in PA over time compared to the control group. This increase in PA indicates the possibility of increased pleasurable engagement with the environment and increased feelings of happiness, joy, alertness, and excitement for the experimental group (Watson et al., 1988). Based on the findings of Stauer et al. (2013), this increase could also represent an increase in mental and physical QOL, even though there were no statistically significant results from the WHOQOL-BREF questionnaire. PA is strongly associated with social activity and exercise, which explains the increase in both PA and the social relationship QOL domain in the experimental group, and further supports connection between PA and QOL (Versteeg et al., 2009). There was a slight increase in NA for both the experimental and control group; however, this increase in NA does not negate the increased PA experienced in the experimental group because NA and PA are independent and do not influence each other (Versteeg et al., 2009). If someone has high PA, typically that person will have low NA, but a person could also experience a high PA and high NA simultaneously (Stauber et al., 2013).

Another statistically significant finding for this study was handgrip strength. The experimental group demonstrated a statistically significant increase in handgrip strength compared to the control group over time. This finding is important because handgrip strength has clinical value and was shown to represent the current overall strength of an individual (Bohannon, 2015). A meta-analysis on handgrip strength showed low handgrip strength is associated with decreased muscle mass and limited physical function, both of which contribute to increased fall risk (Bohannon, 2015). Handgrip strength also has a prognostic value. The Bohannon (2015) meta-analysis showed handgrip strength as an excellent predictor of 5-year mortality and poor physical function. A study by Kim at al. (2016) found that handgrip strength was a better predictor of physical performance and mortality than knee extension strength or muscle mass. This significant increase in handgrip strength for the experimental group may demonstrate an improvement in physical function and muscle mass, and therefore a decrease in fall risk, as a result of participating in the Bingocize® program.

While there were no statistically significant results for the 30-second chair stand test, there was some clinical significance in favor of the experimental group. The CDC assesses fall risk based on the participant's age and the amount of chair stands completed during the 30 seconds (CDC, 2017). Based on this information and the results from the baseline chair stand test, eight experimental group participants were at risk for falls; however, three of those participants completed enough chair stands during the post-invention data collection to no longer be in the fall risk category. The control group started with five participants in the fall risk category at baseline, and only one of those participants completed enough chair stands to no longer be considered a fall risk during

the post-intervention assessments. Additionally, there were three participants in the control group that were not considered a fall risk for this assessment at baseline, but declined to the "fall risk" category during the post-intervention assessments.

The participant demographics could help explain some of the non-significant results that were found for this study. According to the CDC, a body mass index (BMI) of 30 kg/m^2 or greater is considered "obese." As seen in Table 2, the average BMI for both conditions was greater than 30 kg/m^2. Being overweight or obese is associated with lower levels of physical activity, a decrease in the ability to perform ADL's, greater levels of pain (which often leads postural and balance problems), and an increase in fall risk (Himes & Reynolds, 2012; Mitchell, Lord, Harvey, & Close, 2014). The average BMI remained in the "obese" category from baseline to post-intervention for both conditions. The fact that, on average, participants started the intervention and remained in the obese BMI category could have potentially contributed to some of the non-significant results for the functional tests. The decreased ability to perform ADL's, as well as the posture and balance problems associated with obesity, could explain why the experimental group did not perform as well in the post-intervention functional tests.

The fear of falling results from the FES were surprising, and could also be explained by the participant demographics. It was hypothesized that fear of falling would improve in the experimental group, however, both the experimental and control group showed an increase in fear of falling. There are a few explanations that could explain why this increase happened. Factors that contribute to a higher fear of falling include being female, having a low income, and having gait or balance problems (which is associated with obesity) (Liu, 2015). As seen in Table 1, the majority of the participants were female

(88.89%), had an BMI that was considered in the "obese" category (52.78%), and were below the 2017 Federal Poverty Level based on their income (77.78%) (United States Census Bureau, 2017). Considering these facts, along with the fact that the participants' gender and income remained the same, and the BMI remained fairly consistent from baseline to post-intervention, it can be concluded that these factors may have inhibited the participants from improving the fear of falling score. Interventions combining physical activity and educational components were more effective at decreasing fear of falling than interventions involving physical activity alone (Jung, 2008). While this intervention did combine both exercise and educational components, the education could have been presented differently in order for the participants to retain more information. For example, instead of the leader only reading the questions and answers, a summary could be provided to the leader for each question in order to promote a discussion with the participants about why that is the correct answer. However, this change could cause an increase in the duration of the sessions, which may affect adherence. Another thing to consider about fear of falling is that it is multi-dimensional and strongly correlated to "the perceived threat of falling, perceived risk of falling, concern about the consequences of falls, and fall-related self-efficacy" (Liu, 2015, p. 1). While the FES is considered to be a reliable and valid assessment to use to measure fear of falling, it only captures the perceived self-efficacy dimension of fear of falling in an individual (Bower et at., 2015). Also, the FES assesses fear of falling based on how confident the individual is completing certain tasks without falling (Bower et al., 2015). These activities may not be relevant to each individual, which may alter results.

There were limitations to this study. One limitation was the demographics of our sample of participants. Based on the demographics on Table 1, the sample of participants may not represent the overall population of community-dwelling older adults. Based on the Population Reference Bureau (PRB), 10% of the American older adult population is under the poverty line and 40% is considered obese (PRB, 2016). As seen on Table 1, of the participants in this study, 77.78% were under the poverty line and 52.78% were considered obese. Both categories negatively impact fall risk and QOL, and both are extremely over-represented in this study sample. Additionally, the sample size for this study was low, which may have affected the results. Based on effect sizes from previous work and the existing research literature, a power analysis determined a total of approximately 40 participants (across both groups) in order to detect at least medium-sized effects (power = .8; beta = .2; alpha = .05; effect (η_p^2)= .40); however, only 36 participants completed this study.

The fidelity of the program is another limitation. The leaders of the Bingocize® program for this study worked in the community centers where the interventions took place because it was unfeasible, due to budget and time constraints, for a trained WKU graduate student to lead the sessions for all of the groups. This causes an increase in external validity because the results can be generalized to other real world situations; however, it also decreases internal validity because it is unknown if the results are due to the independent variable or other confounding variables. Also, it is unknown if those leaders had any experience leading an exercise program. The leaders were trained beforehand on how to run the program and how to instruct the exercises; however, it can only be assumed that the leaders led the program correctly. Travel to the community

centers to check fidelity was not an option for this study due to budget constraints. For future studies, it would be best to have a trained and qualified student led the sessions to ensure fidelity of the program. Doing so will improve internal validity, but reduce external validity. Another solution would be for a qualified person to visit the community centers while the Bingocize® sessions are occurring. This allows the person to observe if the program is being led the correct way, and would also increase the internal validity. Another fidelity limitation had to do with interrater reliability. Due to scheduling conflicts, the data collectors were not always the same people, causing interrater reliability to be affected. The data collectors were all trained exercise science students (either undergraduate or graduate students), however, this inconsistency could have caused an inconsistency with the results.

For future research related to the Bingocize® program, or other similar interventions, it is suggested the participants perform the exercises at a higher intensity in order to reach the minimum duration and intensity of exercise per week recommended by ACSM. Another way to reach the minimal amount and intensity of exercise needed for older adults would be to keep the exercises at a moderate intensity, while also having the older adults participate in the program three times per week, instead of just twice per week. This increase in duration allows the older adults to reach the minimum amount of exercise needed, while also maintaining a moderate intensity for the exercises being performed. In addition, the Bingocize® leaders not only need to be trained on how to monitor the participants' intensity properly, but should also be observed to ensure intensity is being monitored the correct way. Another suggestion for future research would be to limit the amount of knowledge the control groups know about the

experimental groups. There was the possibility of a Hawthorne effect occurring in this study, because the control group knew the experimental group was participating in exercises and health knowledge, while the control group was not. This created a competitive environment during the post-intervention data collections. The data collectors heard multiple participants from the control group mention wanting to "beat the experimental group," meaning the participants in the control group had extra motivation to perform better on the tests. Lastly, additional assessments to measure fear of falling should be explored, due to the multi-dimensional nature of fear of falling.

In conclusion, participating in the Bingocize® health promotion program can produce a meaningful and detectable change in handgrip strength and PA in community-dwelling older adults. In addition, this program can also produce clinically significant results for the chair stand test. However, further investigations using this program with a larger participant sample, improved fidelity, and higher intensity and/or duration of exercise is needed to determine if this program can be an effective fall risk prevention program.

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Appendix A: Exercise Descriptions

Warm-Up Exercises	
Exercise	Description
Single Arm Crossover	Gently pull one arm across chest below the chin. Hold and repeat with opposite arm.
Triceps Stretch	Extend right arm straight up, palm facing forward. Bend your right elbow, letting your hand hinge down behind your head as if you were patting yourself on the back. With your left hand, place hand on right elbow, gently pulling until you feel a stretch down the back of your upper arm. Repeat with left arm.
Head Turns	With straight posture, slowly and gently turn head towards the left and hold for a few seconds. Repeat with right side. Do not hyperextend the head!
Round & Release	Participants sit tall, on the edge of a sturdy chair, with feet on the floor about hip-width apart. Cue to feel the weight on their "sit bones" and tailbone, which is about 0.5 inch above the chair. Weight is on the sit bones but NOT on the tailbone. Cue to exhale, sit back — back into the chair…how about curl backward, flexing the lower spine while firmly contracting the abdominals. Imagine pulling the navel to the spine and cue to rock back onto the tailbone into a posterior pelvic tilt. Then, cue to inhale and sit as tall as possible. They should feel their tailbone lift up and off the chair as the weight shifts to their "sit bones," with the pelvis in a neutral position. The spine also lifts into good upright neutral alignment. Cue to lengthen the neck and lift the chest (Sanders, 2013).
Trunk Rotation	Participants to sit on the edge of the chair, with feet on the floor shoulder-width apart. "squeeze shoulder blades slightly together." Have participants reach arms out to the sides, as if they were making a "T" (90 degrees, shoulder abduction) while maintaining scapular retraction. Cue participants to twist the upper body to the right and pulse, gently pushing further three times into spinal rotation, exhaling with each pulse. Inhale and return to center, then repeat to the left (Sanders, 2013).
Mermaids	Participants should begin by sitting on the edge of the chair, feet hip-width apart on the floor, spine erect and in neutral. Place one hand on the side of the chair for support. Then have them inhale and perform a continuous motion, sweeping the opposite arm out to the side and up overhead Encourage participants to exhale as they continue the

	motion, moving through full range and finally into a side bend (spinal lateral flexion) where they pause, inhale, and return back to the starting position. Repeat on the other side (Sanders, 2013).
Head Half Circles	Gently rotate head forwards until chin reaches center of chest. Now, slowly rotate head backwards until eyes are directed upwards. Repeat with both sides. Do not hyperextend the head!
Calf Stretch with Chair	Place both hands on a chair. With one leg bent at a 90-degree angle and the opposing leg straight, lean into chair. Heels should not rise off the floor.
March in Place	Most individuals have either performed a march, or have seen one. Perform this exercise by walking in place (the pace will be a little quicker than walking). However, on every step raise the knee so that the hip and knee both reach near 90 degrees of flexion. Make sure to pump arms back and forth; this will add to the cardiovascular benefit as well as preparing the shoulder girdle for movement. Note: participants may perform a slower march focusing on good knee and hip flexion.

Balance Exercises	
Exercise	Description
Staggered Stance	Being with feet together and hands at sides. Step forward with your right foot. Maintain this position for 10 seconds. Alternate putting the other foot in front.
Ankle Flex	Being with feet together and hands at sides. Step forward with your right foot. Maintain this position for 10 seconds. Alternate putting the other foot in front.
Grapevine	Begin standing with arms at sides, feet together. Step across in front of your left foot with right leg. Continue to step sideways uncrossing the right leg. Take 3 steps then reverse and cross your right leg behind your left leg. Continue to step sideways, uncrossing the left leg. Repeat 3 times in each direction
Static Balance (single leg)	Stand on a balance pad with eyes focused forward, arms crossed over the chest, and one leg elevated to about ankle level without touching the support leg. Repeat with opposing leg.
3-Dot Step with Reach	This exercise is designed to change the center of gravity while moving forward, sideways, and backwards. During the movement, use the arms by reaching out in the same direction of the step. Begin by standing with feet together and arms down to the sides of the body. Select a side to train. Note that during this exercise the opposite foot

	should never leave the ground. Now on the side chosen to work, take a step lunge forward (lunge; slightly bending front knee), about 2-3 feet. During this stepped lunge reach the arms out in front, away from the body. Now return to the starting position. Now with the same foot, step out to the side, about 2-3 feet; during the step reach your arms out in the same direction of the step (to the side). Return to the starting position. Now step backwards about 2-3 feet, while allowing the arms to open backwards into a horizontal reach (hands together extended out from chest, open arms along the horizontal plane. Continue to open arms until they are 180^0 apart). Note that when the backwards step is made, the front knee will bend and the back leg (stepped leg) will remain straight. Return to the starting position. Repeat these three steps 5 times on both sides of the body.
Side-to-Side Steps with Arm Swings (Modified Skiers)	Sidestep one direction and bring the opposite foot behind the stepped leg. Repeat this movement in the opposite directions. Let the arms swing naturally side-to-side in the movement of the stepped direction. Perform the side-to-side steps for 30 seconds.
Side Steps	Ensure that participants are more than 5 feet apart from one another. Begin with feet together and arms at your side. Either right or left, begin side stepping to the direction the arm is pointed. Note that the feet should come back together between each side step. Also, avoid turning out the lead foot. Ensure that both feet remain facing forward during the entire exercise. While stepping, add a lateral shoulder raise with the arm of the step direction. Relax arm down when feet are brought together. Perform equal repetitions in both directions.
Side Steps on Balance Pad	Begin exercise on either the right or left side of a balance pad. Participants will side step with one leg first, followed by the second until both legs are firmly anchored on the balance pad. Next, older adults will execute same procedure by stepping off the opposite side of the balance pad. Repeat for specific duration.
Step Ups on Balance Pad	Standing in front of the balance pads, older adults' will step on the balance pad
Heel Raises on Balance Pad	While standing on a balance pad, older adults are asked to raise their heels off the pad while keeping their knees straight. Hold this position for about 6 seconds, then slowly lower heels to the floor. Note: a chair may be used for

	support.
Walk in place on Balance Pad	Walk in place for a designated time period. Older adults should focus more on correct form rather than number of steps. Older adults should mimic a march

Strength Building Exercises	
Exercise	Description
Leg Extension	While seated, extend right foot. Slowly return to starting position and repeat with left foot.
Hip Abduction	Using a chair for support, participants are asked to slowly raise one leg out to the side of their body, keeping their foot flexed. Then lower back toward their standing leg, keeping their hips centered.
Heel Raises	While standing behind a chair for support, participants raise their heels off the ground while keeping their knees straight. Slowly lower heels to the ground. Repeat this activity for desired reps.
Chair Squat	This exercise requires a chair and stable ground to stand on. Begin by sitting in the chair with your arms extended straight out in front of you. Now engage your leg muscles so that you stand up out of the chair. Refrain from leaning forward. Also, make sure you do not sway side to side. If this exercise is too challenging, then add a sturdy support, such as another person, chair, counter top, table, etc. Repeat exercise by returning to the seated position. Note: Posture control is the same when transferring the body from a seated to standing position and standing to seated position. Tip: During the exercise imagine a line that extends upward from the end of your toes. Try to keep your head and knees behind this line.
Rear Leg Extensions	This exercise requires a chair and a stable ground to stand on. Begin by standing behind the chair, and holding on to the back on the chair for support. Feet should be hip-width apart. Place one foot behind you and keep that leg extended, without locking your knees. Keeping your head and back aligned (make sure to not arch the back), begin to lift the leg behind you.
Single Leg Standing Hamstring Curls	This exercise requires a chair and a stable ground to stand on. Begin by standing behind the chair, and holding on to the back on the chair for support. Feet should be hip-width apart. With one leg on the ground for support, begin to flex at the knee with the other leg until the heel of your foot comes in contact

	with your gluteus. Then slowly extend the leg back to standing position.
Seated Crunches	While seated, slowly raise one knee towards the chest, while simultaneously curling your upper body to meet your knee. Hold contraction for one second, then return to seated position.
Seated Oblique Crunch	While seated and with your arms crossed across your chest, slowly raise one knee up, while simultaneously curling your upper body down. Twist the torso so that the knee of the leg you are raising and the elbow of the opposite side come in contact. Hold the contraction for one second, then return to seated position.
Seated Good Morning	Begin in the seated position, with your legs wider than shoulder width apart. While keeping the spine erect and extended, slowly bend forward at the hips. Then slowly bend back up (again keeping the spine erect and extended) into seated position.
Reverse Fly	Hold resistance band directly in front of chest. Arms should be extended away from body and straight. While holding the rubber portion of the band, slowly pull arms away from older adults' center, allowing band to stretch across chest. Once band has been fully extended, slowly release to starting position.
Chest Fly	Hold the resistance band handles, with the resistance band behind your upper back. Position your arms out to your side and parallel to the ground, with a slight bend. Slowly bring your hands together, while also maintaining the same slight bend in the arms (do not bend the arms anymore while bringing the hands together). Once both of your hands come in contact, slowly return to your starting position.

Appendix B: Bingocize® Sessions for Experimental Group

Session 1		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#1** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance (each foot)	1	30 secs/foot
Leg Extensions (each leg)	1	12
Seated Crunches	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#2**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Seated Good Morning	1	12
Static Stance (each foot)	1	30 secs
Hip Abductions (each leg)	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#3**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Side Steps	1	30 secs
Heel Raises	1	12
Seated Oblique Crunch	1	12
14. Call out **THREE** bingo numbers		

15. Health Knowledge Question **#4**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Chest Fly	1	12
Ankle Flex (each foot)	1	10 secs
Single-leg Standing Hamstring Curls (each leg)	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 2		
1. Warm-up exercises	**Sets**	**Reps**
Triceps Stretch (each arm)	1	30 secs.
Trunk Rotation	1	3 pulses/side
Head Half Circles	1	30 secs
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#5** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Static Balance (single leg)	1	30 secs/leg
Single Leg Standing Hamstring Curl	1	12/leg
Chest Fly	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#6**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs
Heel Raises	1	12
Seated Oblique Crunch	1	12
10. Call out **THREE** bingo numbers		

11. Health Knowledge Question **#7**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Reverse Fly	1	12
Ankle flex	2	10 secs/foot
Hip Abduction	1	10/side
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#8**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Chair Stands	1	12
Seated Crunches	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 3		
1. Warm-up exercises	**Sets**	**Reps**
Mermaids	1	30 secs/side
Head Turns	2	3 secs/side
Round and Release	1	3
Single Arm Crossover	1	30 secs/arm
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#9** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Ankle Flex	2	10 secs/foot
Chair Stand	1	12

Seated Good Morning	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#10**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Static Balance	1	30 secs/foot
Leg Extension	1	10/leg
Heel raises	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#11**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Single Leg Hamstring Curls	1	12/leg
Seated Crunches	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#12**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs
Hip Abduction	1	12/side
Chest Fly	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 4		
1. Warm-up exercises	**Sets**	**Reps**
Mermaids	1	30 secs/side
Single Arm Crossover	1	30 secs/arm
Round and Release	1	3
Calf Stretch with Chair	1	30 secs/leg
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		

3. Health Knowledge Question **#13** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs
Hip Abductions	1	12/leg
Reverse Fly	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#14**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Chair Stands	1	12
Seated Good Morning	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#15**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Static Balance	1	30 secs/foot
Rear Leg Extensions	1	12/leg
Chest Fly	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#16**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Ankle Flex	2	10 secs/foot
Heel Raises	1	12
Seated Oblique Crunch	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 5		

1. Warm-up exercises	**Sets**	**Reps**
Round and Release	1	3
Head Half Circles	1	30 secs
Trunk Rotations	1	3 pulses/side
Single Arm Crossover	1	30 secs/arm
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#17** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side-to-side with Arm Swings (modified skiers)	1	10/side
Seated Crunches	1	12
Reverse Fly	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#18**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	10/side
Single Leg Standing Hamstring Curls	1	12/side
Heels Raises	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#19**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Static Balance	1	30 secs/foot
Hip Abductions	1	12/leg
Seated Oblique Crunch	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#20**		
16. Call out **THREE** bingo numbers		

17. Exercise	**Sets**	**Reps**
Ankle Flex	2	10 secs/foot
Chair Stands	1	12
Chest Fly	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 6		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#21** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side-to-side steps with Arm Swings	1	10/side
Rear Leg Extensions	1	12/side
Leg Extensions	1	12/side
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#22**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	10
Seated Crunches	1	12
Chair Stands	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#23**		
12. Call out **THREE** bingo numbers		

13. Exercise	**Sets**	**Reps**
Ankle Flex	1	10/foot
Heel Raises	1	12/side
Single Leg Standing Hamstring Curls	1	12/side
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#24**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs
Chest Fly	1	12
Seated Good Morning	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 7		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Triceps Stretch (each arm)	1	30 secs
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#25** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Chair Stand	1	12
Reverse Fly	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#26**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**

Staggered Stance	1	30 secs
Hip Abductions	1	12/side
Chest Fly	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#27**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Heel raises	1	12
Seated Crunches	1	12
Seated Good Morning	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#28**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Static Balance	1	30 secs/foot
Single Leg Standing Hamstring Curls	1	12/side
Reverse Fly	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 8		
1. Warm-up exercises	**Sets**	**Reps**
Triceps Stretch (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Head Turns	2	3 secs/side
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#29** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**

Side Steps	1	10/side
Hip Abductions	1	12/side
Seated Oblique Crunch	1	10/side
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#30**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Ankle Flex	1	10/foot
Chair Stands	1	12
Seated Good Morning	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#31**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Side-to-side Steps with Arm Swings	1	10/side
Heels raises	1	12
Chest Fly	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#32**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs
Leg Extensions	1	12/side
Reverse Fly	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 9		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Trunk Rotation	1	3 pulses/side
Head Half Circles	1	30 secs
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		

3. Health Knowledge Question **#33** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Chair Stands	1	12
Seated Crunch	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#34**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Hip Abductions	1	12/side
Heel Raises	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#35**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Ankle Flex	1	12/foot
Seated Good Morning	1	12
Chest Fly	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#36**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs
Leg Extensions	1	12/leg
Reverse Fly	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 10		
1. Warm-up exercises	**Sets**	**Reps**

Triceps Stretch (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Head Turns	2	3 secs/side
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#37** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Static Balance	1	20 secs/leg
Hip Abduction	1	12/side
Seated Oblique Crunch	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#38**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	1	5/side
Chair Stands	1	12
Seated Good Morning	1	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#39**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Side Steps	1	12
Rear Leg Extensions	1	12/leg
Heel Raises	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#40**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**

Staggered Stance	2	30 secs
Leg Extensions	1	12/leg
Seated Crunches	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 11		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#41** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Chair Stands	1	12
Seated Crunch	1	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#42**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Hip Abductions	1	15/side
Heel Raises	1	15
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#43**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**

Ankle Flex	1	12/foot
Seated Good Morning	1	12
Chest Fly	1	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#44**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30 secs
Leg Extensions	1	15/leg
Reverse Fly	1	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 12		
1. Warm-up exercises	**Sets**	**Reps**
Trunk Rotations	1	3 pulses/side
Head Turns	2	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#45** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side-to-side with arm swings	1	12
Rear Leg Extensions	1	15/leg
Seated Crunches	1	15
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#46**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**

Static Stance	2	30 secs/foot
Hip Abductions	1	15/leg
Seated Good Morning	1	15
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#47**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	1	5/side
Chair Stand	1	15
Chest Fly	1	15
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#48**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30secs
Heels Raises	1	15
Reverse Fly	1	15
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 13		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#49** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**

Ankle Flex	1	15/foot
Chair Stand	2	12
Seated Oblique Crunch	1	10/side
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#50**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Static Stance	2	30 secs/foot
Hip Abductions	1	15/side
Leg Extensions	1	15/side
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#51**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Grapevine	1	12
Seated Crunch	1	15
Chest Fly	1	15
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#52**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
3-Dot Step with reach	1	5/side
Heel Raises	1	15
Reverse Fly	1	15
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 14		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		

3. Health Knowledge Question **#53** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Static Stance	1	30 secs
Hip Abductions	2	10/leg
Seated Good Morning	2	10
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#54**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Side-to-side Steps with Arm Swings	1	12
Chair Squat	2	12
Chest Fly	2	10
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#55**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Grapevine	1	12
Single Leg Standing Hamstring Curls	1	15/leg
Seated Crunches	2	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#56**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	1	5/side
Heel Raises	2	12
Reverse Fly	2	10
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 15		
1. Warm-up exercises	**Sets**	**Reps**

Trunk Rotations	1	3 pulses/side
Head Turns	2	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#57** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side Steps	1	12/side
Chair Stands	2	12
Seated Crunch	2	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#58**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Hip Abductions	2	12/side
Heel Raises	2	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#59**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Ankle Flex	1	15/foot
Seated Good Morning	1	15
Chest Fly	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#60**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**

Staggered Stance	2	30 secs
Leg Extensions	2	10/leg
Reverse Fly	2	10
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 16		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#61** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs/foot
Chair Squat	2	12
Leg Extension	2	12/leg
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#62**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Heel Raises	2	12
Seated Oblique Crunch	1	10/side
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#63**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**

3-Dot Step with Reach	2	5/side
Rear Leg Extensions	2	10/side
Seated Good Morning	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#64**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30 secs
Single Leg Standing Hamstring Curl	2	10/leg
Seated Crunch	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 17		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Triceps Stretch (each arm)	1	30 secs
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#65** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side-to-Side with Arm Swings	1	12
Hip Abductions	2	10/leg
Chest Fly	2	10
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#66**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**

Static Balance	1	30 secs/foot
Chair Stands	2	12
Reverse Fly	2	10
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#67**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Ankle Flex	1	15/side
Rear Leg Extensions	2	10/leg
Chest Fly	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#68**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30 secs
Heel Raises	2	12
Seated Crunch	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 18		
1. Warm-up exercises	**Sets**	**Reps**
Round and Release	1	3
Head Half Circles	1	30 secs
Trunk Rotations	1	3 pulses/side
Single Arm Crossover	1	30 secs/arm
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#69** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		

5. Exercise	**Sets**	**Reps**
Static Balance	1	35 secs
Chair Squat	2	12
Seated Oblique Crunch	1	10/side
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#70**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Single Leg Standing Hamstring Curls	2	12/leg
Seated Good Morning	2	10
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#71**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Ankle Flex	1	15/side
Leg Extensions	2	10/side
Chest Fly	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#72**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	2	5/side
Seated Crunch	2	10
Reverse Fly	2	10
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 19		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.

2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#73** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs/foot
Chair Squat	2	12
Leg Extension	2	12/leg
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#74**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Heel Raises	2	12
Seated Oblique Crunch	1	10/side
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#75**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	2	5/side
Rear Leg Extensions	2	10/side
Seated Good Morning	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#76**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30 secs
Single Leg Standing Hamstring Curl	2	10/leg
Seated Crunch	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		

Session 20		
1. Warm-up exercises	**Sets**	**Reps**
Triceps Stretch (each arm)	1	30 secs.
Trunk Rotation	1	3 pulses/side
Head Half Circles	1	30 secs
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#77** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Side-to-Side with Arm Swings	1	12
Hip Abductions	2	10/leg
Chest Fly	2	10
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#78**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Static Balance	1	30 secs/foot
Chair Stands	2	12
Reverse Fly	2	10
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#79**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Ankle Flex	1	15/side
Rear Leg Extensions	2	10/leg
Chest Fly	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#80**		

16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30 secs
Heel Raises	2	12
Seated Crunch	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 21		
1. Warm-up exercises	**Sets**	**Reps**
Triceps Stretch (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Head Turns	2	3 secs/side
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#81** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Static Balance	1	35 secs
Chair Squat	2	12
Seated Oblique Crunch	1	10/side
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#82**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Single Leg Standing Hamstring Curls	2	12/leg
Seated Good Morning	2	10
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#83**		

12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Ankle Flex	1	15/side
Leg Extensions	2	10/side
Chest Fly	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#84**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	2	5/side
Seated Crunch	2	10
Reverse Fly	2	10
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 22		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#85** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance	2	35 secs
Hip Abductions	2	12/leg
Seated Crunch	2	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#86**		

8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Chair Squat	2	12
Chest Fly	2	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#87**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Static Balance	1	35
Leg Extensions	2	12/leg
Reverse Fly	2	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#88**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Heel Raises	2	12
Seated Good Morning	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 23		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.
March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#89** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		

4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance	1	30 secs/foot
Chair Squat	2	12
Leg Extension	2	12/leg
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#90**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Heel Raises	2	12
Seated Oblique Crunch	1	10/side
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#91**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
3-Dot Step with Reach	2	5/side
Rear Leg Extensions	2	10/side
Seated Good Morning	2	10
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#92**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Staggered Stance	2	30 secs
Single Leg Standing Hamstring Curl	2	10/leg
Seated Crunch	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		
Session 24		
1. Warm-up exercises	**Sets**	**Reps**
Single Arm Crossover (each arm)	1	30 secs.
Round & Release	1	3
Mermaids	1	30 secs/side
Calf Stretch with Chair (each leg)	1	30 secs.

March in Place	1	1 min.
2. Call out **THREE** bingo numbers		
3. Health Knowledge Question **#93** (repeat these steps for every health knowledge question).		
Read the question and allow time for the participants to circle the answer in their packet		
Allow time for the participants to circle the answer in their packet		
Once everyone has answered in their own packet, read out the correct answer.		
4. Call out **THREE** bingo numbers		
5. Exercise	**Sets**	**Reps**
Staggered Stance	2	35 secs
Hip Abductions	2	12/leg
Seated Crunch	2	12
6. Call out **THREE** bingo numbers		
7. Health Knowledge Question **#94**		
8. Call out **THREE** bingo numbers		
9. Exercise	**Sets**	**Reps**
Grapevine	1	12
Chair Squat	2	12
Chest Fly	2	12
10. Call out **THREE** bingo numbers		
11. Health Knowledge Question **#95**		
12. Call out **THREE** bingo numbers		
13. Exercise	**Sets**	**Reps**
Static Balance	1	35
Leg Extensions	2	12/leg
Reverse Fly	2	12
14. Call out **THREE** bingo numbers		
15. Health Knowledge Question **#96**		
16. Call out **THREE** bingo numbers		
17. Exercise	**Sets**	**Reps**
Side Steps	1	10/side
Heel Raises	2	12
Seated Good Morning	2	12
18. Call out **THREE** bingo numbers. Continue calling numbers until there is a winner.		
20. Cool Down (repeat all exercises from the warm-up, excluding the "marching in place")		

Appendix C: Example of Bingocize® playing card

6	17	22	24	5
21	7	18	1	15
9	2	Free Space	4	10
14	8	13	11	16
12	20	3	23	19

Appendix D: Health Knowledge Questions for Experimental Group Participants

Correct Answer	*Instructions: When instructed by the leader, circle one answer that you believe is correct. Mark the correct answer choice that the leader provides on the blank beside the corresponding question number.*

_____ **1. What percentage of people 65 and older fall each year?**

a) 25%

b) 33%

c) 50%

d) 75%

_____ **2. Which one of these is not a symptom of depression?**

a) Weight loss

b) Headaches

c) Cold Sweats

d) Exhaustion

_____ **3. Medication management can reduce interactions and side effects that may lead to falls.**

a) True

b) False

_____ **4. Exercise can help improve _____.**

a) Memory

b) Sleep habits

c) Overall mood

d) All of the above

_____ **5. Where do the majority of falls occur?**

a) Within the home

b) Walking in the park

c) At work

d) Hiking in the woods

_____ **6. If you experience pain or difficulty being physically active, you should _____.**

a) See a physical therapist or doctor

b) Continue to be active anyway

c) Do nothing about the pain

d) Refuse to be active in the future

_____ **7. How would you classify an individual who has fallen two or more times in the past year?**

a) No risk

b) Low risk

c) Moderate risk

_____ **d) High risk**

8. Being physically active at a _____ intensity can improve mental health benefits.

a) Low

b) Moderate

c) High

_____ **9. People who have fallen once are likely to fall again.**

a) True

b) False

_____ **10. What can improve quality of life in older adults?**

a) Physical activity

b) Rest

c) Depression

d) None of the above.

_____ **11. Increasing the intake of which vitamin can help reduce falls?**

a) Vitamin A

b) Vitamin B

c) Vitamin C

d) Vitamin D

_____ **12. One out of ____ falls causes a series injury such as a broken bone or head injury.**

a) Three

b) Five

c) Seven

d) Ten

_____ **13. Being physically active _____ a week can improve mental health benefits.**

a) 2 days

b) 3 days

c) 4 days

d) 5 days

_____ **14. What can the fear of falling among older adults lead to?**

a) Decreased activity

b) Increased independence

c) More social involvement

d) Using more stairways

_____ **15. Regular exercise can help improve _____.**

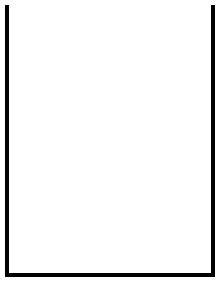
a) Depression

b) Anxiety

c) ADHD

d) All of the above

_____ **16. Approximately what percentage of older adults, over the age of 60, suffer from a mental disorder (depression, anxiety, dementia, etc.)?**



a) 50%
b) 5%
c) 75%
d) 25%

_____ **17. When rising from a lying or sitting position, _____ is a common cause of falls due to dizziness or fainting.**

a) Low blood pressure

b) High blood pressure

c) Getting up too slowly

d) None of the above

_____ **18. Fall-related deaths have increased over the past decade.**

a) True

b) False

_____ **19. When exercising to reduce the risk of falling, you should:**

a) Continue exercising even if you feel pain

b) Ignore any dizziness and hope it passes

c) Do exercises slowly and gently

_____ **d) All of the above**

20. What should you do if you fall?

a) Immediately stand up

b) Ignore any pain

c) Stay calm and relax

d) Don't tell the doctor about your fall

_____ **21. If left untreated, depression can worsen other illness that a person might have.**

a) True

b) False

_____ **22. Not everyone can gain the health benefits of physical activity.**

a) True

b) False

_____ **23. Exercise reduces the chemicals in the brain that can make you feel happier.**

a) True

b) False

_____ **24. Exercise is one of the most important ways to improve your mental health.**

a) True

b) False

_____ **25. Exercise increases stress levels.**

a) True

b) False

_____ **26. People who exercise regularly tend to have a better sense of well-being.**

a) True

b) False

_____ **27. Physical activity can decrease fall prevention.**

a) True

b) False

_____ **28. Depression is a(n) _____ illness with the correct care.**

a) Untreatable

b) Moderately treatable

c) Highly treatable

29. Quality of life can be defined as:

a) **The amount of materialistic items an individual owns.**
b) **The overall sense of well-being, which includes happiness and satisfaction with life.**
c) **The amount of money an individual has.**
d) **None of the above.**

30. Lower flexibility and stiff joints does not affect our balance.

a) **True**
b) **False**

31. Being physically active can help improve your ability to do the things you want to do and prevent falls.

a) **True**
b) **False**

32. The risk of falling increases with every decade of life in older adults.

a) **True**
b) **False**

33. Mental health has an impact on physical health.

a) True
b) False

34. How can you make your home safer to prevent falls?

a) Remove clutter and tripping hazards
b) Put railings on stars
c) Add grab bars to bathroom
d) Have good lighting
e) All of the above

35. Reducing or eliminating which type of drug/supplement can decrease fall risk?

a) Blood pressure medicine
b) Calcium
c) Psychoactive drugs
d) Iron

36. What can individuals wear to prevent falls?

a) Sensible shoes
b) Sensible clothing

c) **Corrective lenses or glasses (if needed)**
d) **All of the above**

37. Depression can be defined as:

a) **Painful feelings come in waves and are often intermixed with positive memories of the deceased.**
b) **Mood and thoughts are almost constantly negative.**
c) **Mood and thoughts are almost constantly positive.**
d) **Happy feelings come in waves and are often intermixed with negative memories of the deceased.**

38. What can contribute to the chance of falling?

a) **Impaired balance**
b) **Using a walker**
c) **Not having rugs in the house**
d) **Wearing shoes with good tread**

39. What can cause a decrease in quality of life in older adults?

a) **Physical impairments**
b) **Mental impairments**
c) **Poor self-esteem**
d) **All of the above**

40. Depression is a sign of weakness.

a) **True**

b)False

41. What percentage of older adults, over the age of 60, do not engage in physical activity?

a) 60%
b) 20%
c) 5%
d) 80%

42. Physical activity can help prevent disease and injury.

a) True
b) False

43. Quality of life can be effected by which of the following factors?

a) Functional health (the ability to perform normal day-to-day activities)
b) Physical Health
c) Emotional Health
d) All of the above

44. Grief and depression are the same thing.

a) True
b) False

45. What percentage of people 65 and older fall each year?

a) 25%

b) 33%

c) 50%

d) 75%

46. Which one of these is not a symptom of depression?

a) Weight loss

b) Headaches

c) Cold Sweats

d) Exhaustion

47. Medication management can reduce interactions and side effects that may lead to falls.

a) True

b) False

48. Exercise can help improve _____.

a) **Memory**

b) **Sleep habits**

c) **Overall mood**

d) **All of the above**

_____ **49. Where do the majority of falls occur?**

a) Within the home

b) Walking in the park

c) At work

d) Hiking in the woods

_____ **50. If you experience pain or difficulty being physically active, you should _____.**

a) See a physical therapist or doctor

b) Continue to be active anyway

c) Do nothing about the pain

_____ **d) Refuse to be active in the future**

51. How would you classify an individual who has fallen two or more times in the past year?

a) No risk

b) Low risk

_____ **c) Moderate risk**

d) High risk

52. Being physically active at a _____ intensity can improve mental health benefits.

a) Low

b) **Moderate**
c) **High**

_____ **53. People who have fallen once are likely to fall again.**

a) True

b) False

_____ **54. What can improve quality of life in older adults?**

a) Physical activity

b) Rest

c) Depression

d) None of the above.

_____ **55. Increasing the intake of which vitamin can help reduce falls?**

a) Vitamin A

b) Vitamin B

c) Vitamin C

d) Vitamin D

_____ **56. One out of ____ falls causes a series injury such as a broken bone or head injury.**

a) Three

b) Five

c) Seven

d) Ten

_____ **57. More than ____ of hip fractures are caused by falling.**

a) 25%

b) 50%

c) 70%

d) 95%

_____ **58. Falls are the most common cause of traumatic brain injuries.**

a) True

b) False

_____ **59. What is the leading cause of hospital admission for older adults?**

a) Heart attacks

b) Falling

c) Car wrecks

d) Stroke

_____ **60. What is a physical factor that can increase falls?**

a) Upper body weakness

b) Lower body weakness

c) Hearing impairment

d) Weak immune system

_____ **61. Being physically active _____ a week can improve mental health benefits.**

a) 2 days

b) 3 days

c) 4 days

d) 5 days

_____ **62. What can the fear of falling among older adults lead to?**

a) Decreased activity

b) Increased independence

c) More social involvement

d) Using more stairways

_____ **63. Regular exercise can help improve _____.**

a) Depression

b) Anxiety

c) ADHD

d) All of the above

_____ **64. Approximately what percentage of older adults, over the age of 60, suffer from a mental disorder (depression, anxiety, dementia, etc.)?**

a) 50%
b) 5%
c) 75%
d) 25%

_____ **65. When rising from a lying or sitting position, _____ is a common cause of falls due to dizziness or fainting.**

a) Low blood pressure

b) High blood pressure

c) Getting up too slowly

d) None of the above

_____ **66. Fall-related deaths have increased over the past decade.**

a) True

b) False

_____ **67. When exercising to reduce the risk of falling, you should:**

a) Continue exercising even if you feel pain

b) Ignore any dizziness and hope it passes

c) Do exercises slowly and gently

_____ **d) All of the above**

68. What should you do if you fall?

a) Immediately stand up

b) Ignore any pain

c) Stay calm and relax

d) Don't tell the doctor about your fall

_____ **69. If left untreated, depression can worsen other illness that a person might have.**

a) True

b) False

_____ **70. Not everyone can gain the health benefits of physical activity.**

a) True

b) False

_____ **71. Exercise reduces the chemicals in the brain that can make you feel happier.**

a) True

b) False

_____ **72. Exercise is one of the most important ways to improve your mental health.**

a) True

b) False

_____ **73. Exercise increases stress levels.**

a) True

b) False

_____ **74. People who exercise regularly tend to have a better sense of well-being.**

a) True

b) False

_____ **75. Physical activity can decrease fall prevention.**

a) True

b) False

_____ **76. Depression is a(n) _____ illness with the correct care.**

a) Untreatable

b) Moderately treatable

c) Highly treatable

77. Quality of life can be defined as:

a) **The amount of materialistic items an individual owns.**
b) **The overall sense of well-being, which includes happiness and satisfaction with life.**
c) **The amount of money an individual has.**
d) **None of the above.**

78. Lower flexibility and stiff joints does not affect our balance.

a) **True**
b) **False**

79. Being physically active can help improve your ability to do the things you want to do and prevent falls.

a) **True**
b) **False**

80. The risk of falling increases with every decade of life in older adults.

a) **True**
b) **False**

81. Mental health has an impact on physical health.

a) True
b) False

82. How can you make your home safer to prevent falls?

a) Remove clutter and tripping hazards
b) Put railings on stars
c) Add grab bars to bathroom
d) Have good lighting
e) All of the above

83. Reducing or eliminating which type of drug/supplement can decrease fall risk?

a) Blood pressure medicine
b) Calcium
c) Psychoactive drugs
d) Iron

84. What can individuals wear to prevent falls?

a) Sensible shoes
b) Sensible clothing
c) Corrective lenses or glasses (if needed)

d) All of the above

85. Depression can be defined as:

a) Painful feelings come in waves and are often intermixed with positive memories of the deceased.
b) Mood and thoughts are almost constantly negative.
c) Mood and thoughts are almost constantly positive.
d) Happy feelings come in waves and are often intermixed with negative memories of the deceased.

86. What can contribute to the chance of falling?

a) Impaired balance
b) Using a walker
c) Not having rugs in the house
d) Wearing shoes with good tread

87. What can cause a decrease in quality of life in older adults?

a) Physical impairments
b) Mental impairments
c) Poor self-esteem
d) All of the above

88. Depression is a sign of weakness.

a) True

b)False

89. What percentage of older adults, over the age of 60, do not engage in physical activity?

a) 60%
b) 20%
c) 5%
d) 80%

90. Physical activity can help prevent disease and injury.

a) True
b) False

91. Quality of life can be effected by which of the following factors?

a) Functional health (the ability to perform normal day-to-day activities)
b) Physical Health
c) Emotional Health
d) All of the above

92. Grief and depression are the same thing.

a) True
b) False

Appendix E: Bingocize® Leader Health Knowledge Questions

1. What percentage of people 65 and older fall each year?
    a. 25%
    b. 33%
    c. 50%
    d. 75%
2. Which one of these is not a symptom of depression?
    a. Weight loss
    b. Headaches
    c. Cold Sweats
    d. Exhaustion
3. Medication management can reduce interactions and side effects that may lead to falls.
    a. True
    b. False
4. Exercise can help improve _____.
    a. Memory
    b. Sleep habits
    c. Overall mood
    d. All of the above
5. Where do the majority of falls occur?
    a. Within the home
    b. Walking in the park
    c. At work
    d. Hiking in the woods
6. If you experience pain or difficulty being physically active, you should _____.
    a. See a physical therapist or doctor
    b. Continue to be active anyway
    c. Do nothing about the pain
    d. Refuse to be active in the future

7. How would you classify an individual who has fallen 2 or more times in the past year?
    a. No risk
    b. Low risk
    c. Moderate risk
    d. High risk
8. Being physically active at a _____ intensity can improve mental health benefits.
    a. Low
    b. Moderate
    c. High
9. People who have fallen once are likely to fall again.
    a. True
    b. False
10. What can improve quality of life in older adults?
    a. Physical activity
    b. Rest
    c. Depression
    d. None of the above.
11. Increasing the intake of which vitamin can help reduce falls?
    a. Vitamin A
    b. Vitamin B
    c. Vitamin C
    d. Vitamin D
12. One out of ____ falls causes a series injury such as a broken bone or head injury.
    a. Three
    b. Five
    c. Seven
    d. Ten
13. More than ____ of hip fractures are caused by falling.

a. 25%

b. 50%

c. 70%

d. 95%

14. Falls are the most common cause of traumatic brain injuries.

a. True

b. False

15. What is the leading cause of hospital admission for older adults?

a. Heart attacks

b. Falling

c. Car wrecks

d. Stroke

16. What is a physical factor that can increase falls?

a. Upper body weakness

b. Lower body weakness

c. Hearing impairment

d. Weak immune system

17. Being physically active _____ a week can improve mental health benefits.

a. 2 days

b. 3 days

c. 4 days

d. 5 days

18. What can the fear of falling among older adults lead to?

a. Decreased activity

b. Increased independence

c. More social involvement

d. Using more stairways

19. Regular exercise can help improve _____.

a. Depression

b. Anxiety

c. ADHD

d. All of the above

20. Approximately what percentage of older adults, over the age of 60, suffer from a mental disorder (depression, anxiety, dementia, etc.)?

a. 50%

b. 5%

c. 75%

d. 25%

21. When rising from a lying or sitting position, _____ is a common cause of falls due to dizziness or fainting.

a. Low blood pressure

b. High blood pressure

c. Getting up too slowly

d. None of the above

22. Fall-related deaths have increased over the past decade.

a. True

b. False

23. When exercising to reduce the risk of falling, you should:

a. Continue exercising even if you feel pain

b. Ignore any dizziness and hope it passes

c. Do exercises slowly and gently

d. All of the above

24. What should you do if you fall?

a. Immediately stand up

b. Ignore any pain

c. Stay calm and relax

d. Don't tell the doctor about your fall

25. If left untreated, depression can worsen other illness that a person might have.

a. True

b. False

26. Not everyone can gain the health benefits of physical activity.

a. True

b. False

27. Exercise reduces the chemicals in the brain that can make you feel happier.

a. True

b. False

28. Exercise is one of the most important ways to improve your mental health.

a. True

b. False

29. Exercise increases stress levels.

a. True

b. False

30. People who exercise regularly tend to have a better sense of well-being.

a. True

b. False

31. Physical activity can decrease fall prevention.

a. True

b. False

32. Depression is a(n) _____ illness with the correct care.

a. Untreatable

b. Moderately treatable

c. Highly treatable

33. Quality of life can be defined as:

a. The amount of materialistic items an individual owns.

b. The overall sense of well-being, which includes happiness and satisfaction with life.

c. The amount of money an individual has.

d. None of the above.

34. Lower flexibility and stiff joints does not affect our balance.

a. True

b. False

35. Being physically active can help improve your ability to do the things you want to do and prevent falls.

a. True

b. False

36. The risk of falling increases with every decade of life in older adults.

a. True

b. False

37. Mental health has an impact on physical health.

a. True

b. False

38. How can you make your home safer to prevent falls?

a. Remove clutter and tripping hazards

b. Put railings on stars

c. Add grab bars to bathroom

d. Have good lighting

e. **All of the above**

39. Reducing or eliminating which type of drug/supplement can decrease fall risk?

a. Blood pressure medicine

b. Calcium

c. Psychoactive drugs

d. Iron

40. What can individuals wear to prevent falls?

a. Sensible shoes

b. Sensible clothing

c. Corrective lenses or glasses (if needed)

d. All of the above

41. Depression can be defined as:

a. Painful feelings come in waves and are often intermixed with positive memories of the deceased.

b. Mood and thoughts are almost constantly negative.

c. Mood and thoughts are almost constantly positive.

d. Happy feelings come in waves and are often intermixed with negative memories of the deceased.

42. What can contribute to the chance of falling?

a. Impaired balance

b. Using a walker

c. Not having rugs in the house

d. Wearing shoes with good tread

43. What can cause a decrease in quality of life in older adults?

a. Physical impairments

b. Mental impairments

c. Poor self-esteem

d. All of the above

44. Depression is a sign of weakness.

a. True

b. False

45. What percentage of older adults, over the age of 60, do not engage in physical activity?

a. 60%

b. 20%

c. 5%

d. 80%

46. Physical activity can help prevent disease and injury.

a. True

b. False

47. Quality of life can be effected by which of the following factors?

a. Functional health (the ability to perform normal day-to-day activities)

b. Physical Health

c. Emotional Health

d. All of the above

48. Grief and depression are the same thing.

a. True

b. False

49. What percentage of people 65 and older fall each year?

a. 25%

b. 33%

c. 50%

d. 75%

50. Which one of these is not a symptom of depression?

a. Weight loss

b. Headaches

c. Cold Sweats

d. Exhaustion

51. Medication management can reduce interactions and side effects that may lead to falls.

a. True

b. False

52. Exercise can help improve _____.

a. Memory

b. Sleep habits

c. Overall mood

d. All of the above

53. Where do the majority of falls occur?

a. Within the home

b. Walking in the park

c. At work

d. Hiking in the woods

54. If you experience pain or difficulty being physically active, you should _____.

a. See a physical therapist or doctor

b. Continue to be active anyway

c. Do nothing about the pain

d. Refuse to be active in the future

55. How would you classify an individual who has fallen 2 or more times in the past year?

a. No risk

b. Low risk

c. Moderate risk

d. High risk

56. Being physically active at a _____ intensity can improve mental health benefits.

a. Low

b. Moderate

c. High

57. People who have fallen once are likely to fall again.

a. True

b. False

58. What can improve quality of life in older adults?

a. Physical activity

b. Rest

c. Depression

d. None of the above.

59. Increasing the intake of which vitamin can help reduce falls?

a. Vitamin A

b. Vitamin B

c. Vitamin C

d. Vitamin D

60. One out of ____ falls causes a series injury such as a broken bone or head injury.

a. Three

b. Five

c. Seven

d. Ten

61. More than ____ of hip fractures are caused by falling.

a. 25%

b. 50%

c. 70%

d. 95%

62. Falls are the most common cause of traumatic brain injuries.

a. True

b. False

63. What is the leading cause of hospital admission for older adults?

a. Heart attacks

b. Falling

c. Car wrecks

d. Stroke

64. What is a physical factor that can increase falls?

a. Upper body weakness

b. Lower body weakness

c. Hearing impairment

d. Weak immune system

65. Being physically active _____ a week can improve mental health benefits.

a. 2 days

b. 3 days

c. 4 days

d. 5 days

66. What can the fear of falling among older adults lead to?

a. Decreased activity

b. Increased independence

c. More social involvement

d. Using more stairways

67. Regular exercise can help improve _____.

a. Depression

b. Anxiety

c. ADHD

d. All of the above

68. Approximately what percentage of older adults, over the age of 60, suffer from a mental disorder (depression, anxiety, dementia, etc.)?

a. 50%

b. 5%

c. 75%

d. 25%

69. When rising from a lying or sitting position, _____ is a common cause of falls due to dizziness or fainting.

a. Low blood pressure

b. High blood pressure

c. Getting up too slowly

d. None of the above

70. Fall-related deaths have increased over the past decade.

a. True

b. False

71. When exercising to reduce the risk of falling, you should:

a. Continue exercising even if you feel pain

b. Ignore any dizziness and hope it passes

c. Do exercises slowly and gently

d. All of the above

72. What should you do if you fall?

a. Immediately stand up

b. Ignore any pain

c. Stay calm and relax

d. Don’t tell the doctor about your fall

73. If left untreated, depression can worsen other illness that a person might have.

a. True

b. False

74. Not everyone can gain the health benefits of physical activity.

a. True

b. False

75. Exercise reduces the chemicals in the brain that can make you feel happier.

a. True

b. False

76. Exercise is one of the most important ways to improve your mental health.

a. True

b. False

77. Exercise increases stress levels.

a. True

b. False

78. People who exercise regularly tend to have a better sense of well-being.

a. True

b. False

79. Physical activity can decrease fall prevention.

a. True

b. False

80. Depression is a(n) _____ illness with the correct care.

a. Untreatable

b. Moderately treatable

c. Highly treatable

81. Quality of life can be defined as:

a. The amount of materialistic items an individual owns.

b. The overall sense of well-being, which includes happiness and satisfaction with life.

c. The amount of money an individual has.

d. None of the above.

82. Lower flexibility and stiff joints does not affect our balance.

a. True

b. False

83. Being physically active can help improve your ability to do the things you want to do and prevent falls.

a. True

b. False

84. The risk of falling increases with every decade of life in older adults.

a. True

b. False

85. Mental health has an impact on physical health.

a. True

b. False

86. How can you make your home safer to prevent falls?

a. Remove clutter and tripping hazards

b. Put railings on stars

c. Add grab bars to bathroom

d. Have good lighting

e. **All of the above**

87. Reducing or eliminating which type of drug/supplement can decrease fall risk?

a. Blood pressure medicine

b. Calcium

c. Psychoactive drugs

d. Iron

88. What can individuals wear to prevent falls?

a. Sensible shoes

b. Sensible clothing

c. Corrective lenses or glasses (if needed)

d. All of the above

89. Depression can be defined as:

a. Painful feelings come in waves and are often intermixed with positive memories of the deceased.

b. Mood and thoughts are almost constantly negative.

c. Mood and thoughts are almost constantly positive.

d. Happy feelings come in waves and are often intermixed with negative memories of the deceased.

90. What can contribute to the chance of falling?

a. Impaired balance

b. Using a walker

c. Not having rugs in the house

d. Wearing shoes with good tread

91. What can cause a decrease in quality of life in older adults?

a. Physical impairments

b. Mental impairments

c. Poor self-esteem

d. All of the above

92. Depression is a sign of weakness.

a. True

b. False

93. What percentage of older adults, over the age of 60, do not engage in physical activity?

a. 60%

b. 20%

c. 5%

d. 80%

94. Physical activity can help prevent disease and injury.

a. True

b. False

95. Quality of life can be effected by which of the following factors?

a. Functional health (the ability to perform normal day-to-day activities)

b. Physical Health

c. Emotional Health

d. All of the above

96. Grief and depression are the same thing.

a. True

b. False

Appendix F: Informed Consent Document

INFORMED CONSENT DOCUMENT

Project Title: THE EFFECTS OF BINGOCIZE®
ON FALL RISK, HEALTH KNOWLEDGE, AND QUALITY
OF LIFE IN COMMUNITY-DWELLING OLDER ADULTS

Investigators: A. Kathryn Dispennette Alyssa.dispennette311@topper.wku.edu
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WKU Department of Kinesiology, Recreaction, & Sport

You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your signed agreement to participate in this project.

You must be 18 years old or older to participate in this research study.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have.

If you then decide to participate in the project, please sign this form in the presence of the person who explained the project to you. You should be given a copy of this form to keep.

1. **Nature and Purpose of the Project:** Older adults benefit greatly from physical activity. Some of the benefits include decreased fall risk, improving quality of life, and increasing independency with activities of daily living. While these benefits are well known, older adults often do not participate in in physical activity or physical activity programs. Bingocize® has been created to motivate older adults to exercise, decrease fall risk, and improve their well-being. The purpose of this study is to test the effectiveness of a 12-week Bingocize® intervention on fall risk, quality of life, and health knowledge about falls and quality of life in community-dwelling older adults.

2. **Explanation of Procedures:**

   a. Complete five (5) questionnaires
   b. Have your height, weight, and blood pressure measured
   c. Complete five (5) physical tests.
      i. Timed up and Go (3 trails)
      ii. 30 second chair stand
      iii. 4 stage balance test
      iv. Hand grip test (using a hand grip dynamotor)
      v. Knee Extension test (using a handheld dynamotor)
   d. Once you complete the testing above, you may be asked to attend two (2) weekly Bingocize® sessions during a 12-week period. Bingocize® combines exercise, health education, and bingo game. These sessions will last approximately 45-60

WKU IRB# 17-383
Approval - 4/6/2017
End Date - 4/6/2018
Expedited
Approval - 4/6/2017

minutes and will occur twice a week. There is a possibility that you will not be selected to participate in Bingocize® and instead be randomly assigned to a group that just plays Bingo. After the intervention, you will complete the same questionnaires and physical tests (including height, weight, and blood pressure).

3. **Discomfort and Risks:** Some physical and emotional stress may occur. Physical stress and injury is possible when performing any type of physical exercise. The exercises in this program will progress in difficultly, in order to decrease the chances of any physical injury occurring. Some emotional stress may be experienced due to losing the Bingo games, not knowing the correct health education answer, or not being able to successfully perform an exercise.

4. **Benefits:** It is expected that the participants will see improvements in their balance, strength, flexibility, and health knowledge. There is also a social benefit associated with the participation of this group program.

5. **Confidentiality:** The answers and results of the data that is collected will be confidential. Your identity as a participant will be kept confidential in any publication of this study and its results. The data that is collected will be maintained securely for a minimum of 3 years.

6. **Refusal/Withdrawal:** Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks. If a medical emergency does occur, you understand that you are responsible for any costs incurred, including but not limited to the services of Emergency Medical Technicians, emergency room care, hospitalization, etc. We strongly encourage you to ensure that you have adequate health insurance coverage or other means of satisfying any costs for which you will be liable.

_____ _____
Signature of Participant Date

_____ _____
Witness Date

- I agree to the audio/video recording of the research. ***(Initial here)*** _____

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-2129

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Approval - 4/6/2017
End Date - 4/6/2018
Expedited
Approval - 4/6/2017

Appendix G: Physican's Release Form

PHYSICIAN'S RELEASE

Patient's Name _____

Title: The effects of Bingocize® on fall risk, health knowledge, and quality of life in community-dwelling older adults.

PURPOSE AND BACKGROUND
Older adults benefit greatly from physical activity. Some of the benefits include decreased fall risk, improving quality of life, and increasing independency with activities of daily living. While these benefits are well known, older adults often do not participate in in physical activity or physical activity programs. Bingocize® has been created to motivate older adults to exercise, decrease fall risk, and improve their well-being. The purpose of this study is to test the effectiveness of a 12-week Bingocize® intervention on fall risk, quality of life, and health knowledge about falls and quality of life in community-dwelling older adults.

PROCEDURES
Participants will be asked to do the complete five physical tests. These tests include, but are not limited to: (a) Timed up and Go (3 trails), (b) 30 second chair stand, (c) 4 stage balance test, (d) Hand grip test (using a hand grip dynamotor), and (d) Knee Extension test (using a handheld dynamotor). During the intervention, each Bingocize® session will last approximately 60 minutes and will occur two times per week. During the sessions, exercises will be alternated with bingo number calling and health education information.

RISKS
Potential risks from participation in the program are typical of those related to participating in physical activity. Specifically, there is a risk of physical injury or discomfort, including muscle soreness. However, we will do our best to ensure that the program progresses gradually and that you are given ample instructions as to how to perform exercises safely or how to perform modifications if your patient cannot do specific exercises.

BENEFITS
The direct benefits to your patient include the potential to improve physical health, including your cardiorespiratory fitness, muscular strength, balance, and flexibility. In addition, there are social benefits to participating.

QUESTIONS
If you have any questions or concerns about your patient's participation in this program, please call Kathryn Dispennette at 919-724-5059 or email at kathryndispennette@gmail.com.

Physician's Signature _____ **Date** _____

Printed name _____

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-2129

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Appendix H: Mini-Mental State Examination (MMSE)

Mini-Mental State Examination (MMSE)

Patient's Name: _____ Date: _____

Instructions: ***Ask the questions in the order listed. Score one point for each correct response within each question or activity.***

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		TOTAL

(Adapted from Rovner & Folstein, 1987)

1

Source: www.medicine.uiowa.edu/igec/tools/cognitive/MMSE.pdf

Provided by NHCQF, 0106-410

Appendix I: Data Collection Sheet

Data Collection Sheet

Study ID: _____ Date: _____

DOB: _____ Age: _____

Tester Initials: _____ **Blood Pressure:** _____

HR: _____

Tester Initials: _____ **Height (cm):**

_____

Tester Initials: _____ **Weight (kg):**

_____

Tester Initials: _____ **Health Knowledge:** _____

Tester Initials: _____ **Fall Risk (circle one):** Low Moderate High

Tester Initials: _____ **Timed Up and Go (seconds):**

Trial 1: _____Trail 2: _____Trail 3: _____

Tester Initials: _____ **30 Sec Chair Stand:** _____

Tester Initials: _____ **4-Staged Balance:**

Feet together: _____ seconds

Semi-Tandem: _____ seconds

Tandem: _____ seconds

Single Foot: _____

seconds

Tester Initials: _____ **Handgrip Strength:**

Trial 1: _____Trail 2: _____Trail 3:

_____Tester Initials: _____ **Knee Extension Strength:**

Trial 1: _____Trail 2: _____Trail 3:

_____

Appendix J: Positive and Negative Affect Scale (PANAS)

Worksheet 3.1 The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)

PANAS Questionnaire

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. **Indicate to what extent you feel this way right now, that is, at the present moment *OR* indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)**

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

_____ 1. Interested	_____ 11. Irritable
_____ 2. Distressed	_____ 12. Alert
_____ 3. Excited	_____ 13. Ashamed
_____ 4. Upset	_____ 14. Inspired
_____ 5. Strong	_____ 15. Nervous
_____ 6. Guilty	_____ 16. Determined
_____ 7. Scared	_____ 17. Attentive
_____ 8. Hostile	_____ 18. Jittery
_____ 9. Enthusiastic	_____ 19. Active
_____ 10. Proud	_____ 20. Afraid

Scoring Instructions:

Positive Affect Score: Add the scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19. Scores can range from 10 – 50, with higher scores representing higher levels of positive affect. Mean Scores: Momentary = 29.7 (*SD* = 7.9); Weekly = 33.3 (*SD* = *7.2)*

Negative Affect Score: Add the scores on items 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20. Scores can range from 10 – 50, with lower scores representing lower levels of negative affect. Mean Score: Momentary = 14.8 (*SD* = 5.4); Weekly = 17.4 (*SD* = 6.2)

Appendix K: Falls Efficacy Scale (FES)

Falls Efficacy Scale

Name:_____ Date:_____

On a scale from 1 to 10, with 1 being very confident and 10 being not confident at all, how confident are you that you do the following activities without falling?

Activity:	**Score:** 1 = very confident 10 = not confident at all
Take a bath or shower	
Reach into cabinets or closets	
Walk around the house	
Prepare meals not requiring carrying heavy or hot objects	
Get in and out of bed	
Answer the door or telephone	
Get in and out of a chair	
Getting dressed and undressed	
Personal grooming (i.e. washing your face)	
Getting on and off of the toilet	
Total Score	

A total score of greater than 70 indicates that the person has a fear of falling

Adapted from Tinetti et al (1990)

Appendix L: World Health Organization Qualitiy of Life Assessment (WHOQOL-BREF)

Instructions

This questionnaire asks how you feel about your quality of life, health, or other areas of your life. Please answer all the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in the last two weeks. For example, thinking about the last two weeks, a question might ask:

For office use		*(Please circle the number)*				
		Not at all	A little	Moderately	Mostly	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You should circle the number that best fits how much support you got from others over the last two weeks. So you would circle the number 4 if you got a great deal of support from others. o

For office use		*(Please circle the number)*				
		Not at all	A little	Moderately	Mostly	Completely
	Do you get the kind of support from others that you need?	1	2	3	(4)	5

You would circle number 1 if you did not get any of the support that you needed from others in the last two weeks. o

For office use		*(Please circle the number)*				
		Not at all	A little	Moderately	Mostly	Completely
	Do you get the kind of support from others that you need?	(1)	2	3	4	5

Please read each question, assess your feelings, and circle the number on the scale that gives the best answer for you for each question.

For office use			(Please circle the number)				
			Very poor	Poor	Neither poor nor good	Good	Very Good
G1 / G1.1	1.	How would you rate your quality of life?	**1**	**2**	**3**	**4**	**5**

For office use			(Please circle the number)				
			Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
G4 / G2.3	2.	How satisfied are you with your health?	**1**	**2**	**3**	**4**	**5**

The following questions ask about **how much** you have experienced certain things in the last two weeks.

For office use			(Please circle the number)				
			Not at all	A little	A moderate amount	Very much	An extreme amount
F1.4 / F1.2.5	3.	To what extent do you feel that physical pain prevents you from doing what you need to do?	**1**	**2**	**3**	**4**	**5**
F11.3 / F13.1.4	4.	How much do you need any medical treatment to function in your daily life?	**1**	**2**	**3**	**4**	**5**
F4.1 / F6.1.2	5.	How much do you enjoy life?	**1**	**2**	**3**	**4**	**5**

For office use			(Please circle the number)				
			Not at all	A little	A moderate amount	Very much	An extreme amount
F24.2 / F29.1.3	6.	To what extent do you feel your life to be meaningful?	1	2	3	4	5

For office use			(Please circle the number)				
			Not at all	Slightly	A Moderate amount	Very much	Extremely
F5.2 / F7.1.6	7.	How well are you able to concentrate?	1	2	3	4	5
F16.1 / F20.1.2	8.	How safe do you feel in your daily life?	1	2	3	4	5
F22.1 / F27.1.2	9.	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about **how completely** you experience or were able to do certain things in the last two weeks.

For office use			(Please circle the number)				
			Not at all	A little	Moderately	Mostly	Completely
F2.1 / F2.1.1	10.	Do you have enough energy for everyday life?	1	2	3	4	5
F7.1 / F9.1.2	11.	Are you able to accept your bodily appearance?	1	2	3	4	5
F18.1 / F23.1.1	12.	Have you enough money to meet your needs?	1	2	3	4	5

For office use		(Please circle the number)				
		Not at all	A little	Moderately	Mostly	Completely
F20.1 / F25.1.1	13. How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
F21.1 / F26.1.2	14. To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

For office use		(Please circle the number)				
		Very poor	Poor	Neither poor nor well	Well	Very well
F9.1 / F11.1.1	15. How well are you able to get around?	1	2	3	4	5

The following questions ask you to say how **good** or **satisfied** you have felt about various aspects of your life over the last two weeks.

For office use		(Please circle the number)				
		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
F3.3 / F4.2.2	16. How satisfied are you with your sleep?	1	2	3	4	5
F10.3 / F12.2.3	17. How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
F12.4 / F16.2.1	18. How satisfied are you with your capacity for work?	1	2	3	4	5

For office use			(Please circle the number)				
			Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
F6.4 / F8.2.2	19.	How satisfied are you with yourself?	**1**	**2**	**3**	**4**	**5**
F13.3 / F17.2.3	20.	How satisfied are you with your personal relationships?	**1**	**2**	**3**	**4**	**5**
F15.3 / F3.2.1	21.	How satisfied are you with your sex life?	**1**	**2**	**3**	**4**	**5**
F14.4 / F18.2.5	22.	How satisfied are you with the support you get from your friends?	**1**	**2**	**3**	**4**	**5**
F17.3 / F21.2.2	23.	How satisfied are you with the conditions of your living place?	**1**	**2**	**3**	**4**	**5**
F19.3 / F24.2.1	24.	How satisfied are you with your access to health services?	**1**	**2**	**3**	**4**	**5**
F.23.3 / F28.2.2	25.	How satisfied are you with your mode of transportation?	**1**	**2**	**3**	**4**	**5**

Appendix M: Health Knowledge Quiz

Participant ID: _____

1. What percentage of people 65 and older fall each year?
    a) 25%
    b) 33%
    c) 50%
    d) 75%

2. Which one of these is not a symptom of depression?
    a) Weight loss
    b) Headaches
    c) Cold Sweats
    d) Exhaustion

3. Medication management can reduce interactions and side effects that may lead to falls.
    a) True
    b) False

4. Exercise can help improve _____.
    a) Memory
    b) Sleep habits
    c) Overall mood
    d) All of the above

5. Where do the majority of falls occur?
    a) Within the home
    b) Walking in the park
    c) At work
    d) Hiking in the woods

6. If you experience pain or difficulty being physically active, you should _____.
    a) See a physical therapist or doctor
    b) Continue to be active anyway
    c) Do nothing about the pain
    d) Refuse to be active in the future

7. How would you classify an individual who has fallen 2 or more times in the past year?
    a) No risk
    b) Low risk
    c) Moderate risk
    d) High risk

8. Being physically active at a _____ intensity can improve mental health benefits.
    a) Low
    b) Moderate
    c) High

9. People who have fallen once are likely to fall again.
    a) True
    b) False

10. Increasing the intake of which vitamin can help reduce falls?
    a) Vitamin A
    b) Vitamin B
    c) Vitamin C
    d) Vitamin D

11. One out of ____ falls causes a series injury such as a broken bone or head injury.
    a) Three

b) Five

c) Seven

d) Ten

12. More than ____ of hip fractures are caused by falling.

a) 25%

b) 50%

c) 70%

d) 95%

13. Falls are the most common cause of traumatic brain injuries.

a) True

b) False

14. What is the leading cause of hospital admission for older adults?

a) Heart attacks

b) Falling

c) Car wrecks

d) Stroke

15. What is a physical factor that can increase falls?

a) Upper body weakness

b) Lower body weakness

c) Hearing impairment

d) Weak immune system

16. Being physically active _____ a week can improve mental health benefits.

a) 2 days

b) 3 days

c) 4 days

d) 5 days

17. What can the fear of falling among older adults lead to?
    a) Decreased activity
    b) Increased independence
    c) More social involvement
    d) Using more stairways

18. Regular exercise can help improve _____.
    a) Depression
    b) Anxiety
    c) ADHD
    d) All of the above

19. Approximately what percentage of older adults, over the age of 60, suffer from a mental disorder (depression, anxiety, dementia, etc.)?
    a) 50%
    b) 5%
    c) 75%
    d) 25%

20. Fall-related deaths have increased over the past decade.
    a) True
    b) False

21. When exercising to reduce the risk of falling, you should:
    a) Continue exercising even if you feel pain
    b) Ignore any dizziness and hope it passes
    c) Do exercises slowly and gently
    d) All of the above

22. Exercise increases stress levels.
    a) True
    b) False

23. Depression is a(n) _____ illness with the correct care.
    a) Untreatable
    b) Moderately treatable
    c) Highly treatable

24. Quality of life can be defined as:
    a) The amount of materialistic items an individual owns.
    b) The overall sense of well-being, which includes happiness and satisfaction with life.
    c) The amount of money an individual has.
    d) None of the above.

25. The risk of falling increases with every decade of life in older adults.
    a) True
    b) False

26. Mental health has an impact on physical health.
    a) True
    b) False

27. How can you make your home safer to prevent falls?
    a) Remove clutter and tripping hazards
    b) Put railings on stars
    c) Add grab bars to bathroom
    d) Have good lighting
    e) All of the above

28. Reducing or eliminating which type of drug/supplement can decrease fall risk?

a) Blood pressure medicine
b) Calcium
c) Psychoactive drugs
d) Iron

29. What can individuals wear to prevent falls?

a) Sensible shoes
b) Sensible clothing
c) Corrective lenses or glasses (if needed)
d) All of the above

30. Depression can be defined as:

a) Painful feelings come in waves and are often intermixed with positive memories of the deceased.
b) Mood and thoughts are almost constantly negative.
c) Mood and thoughts are almost constantly positive.
d) Happy feelings come in waves and are often intermixed with negative memories of the deceased.

Appendix N: Health History Form

Date_____Name_____ID#_____

Age: _____Sex: M F

Race/Ethnicity (please circle one):

1. Caucasian
2. African-American
3. American Indian
4. Hispanic/Latino
   Other

Highest Level of Education (please circle one):

1. Less than high school
2. High school
3. Associate's Degree
4. Bachelor's Degree
5. Graduate Degree

What is your yearly income? (please circle one):

1. Less than $10,000
2. $10,000 - $15,000
3. $15,000 - $20,000
4. $20,000 - $25,000
5. $25,000 - $35,000
6. $35,000 - $50,000
7. $50,000 - $75,000
8. Greater than $75,000

Personal Address:

_____

Street City State Zip

Phone (Cell): _____

Email address: _____

In case of emergency, whom may we contact?

Name: _____ Relationship: _____

Phone (Cell):_____ (Home):_____

Personal physician

Name: _____ Phone: _____

Fax: _____

Present/Past History

Have you had or do you presently have any of the following? (Check if yes.)

_____ Rheumatic fever

_____ Recent operation

_____ Edema (swelling of ankles)

_____ High blood pressure

_____ Low blood pressure

_____ Injury to back or knees

_____ Seizures

_____ Lung disease

_____ Heart attack or known heart disease

_____ Fainting or dizziness

_____ Diabetes

_____ High Cholesterol

_____ Orthopnea (the need to sit up to breathe comfortably) or paroxysmal (sudden, unexpected attack) or nocturnal dyspnea (shortness of breath at night)

_____ Shortness of breath at rest or with mild exertion

_____ Chest pains

_____ Palpitations or tachycardia (unusually strong or rapid beat)

_____ Intermittent claudication (calf cramping)

_____ Pain, discomfort in the chest, neck, jaw, arms, or other areas

_____ Known heart murmur

_____ Unusual fatigue or shortness of breath with usual activities

_____ Temporary loss of visual acuity or speech, or short-term numbness or weakness in one side, arm, or leg of your body

_____ Cancer

_____ Diabetic Neuropathy (nerve damage in the feet/legs due to diabetes)

_____ Other (please describe): _____

Activity History

1. Have you participated in an exercise program within the last 30 days? Yes _____ No _____
   If yes, briefly describe the
   program:_____
   _____
   _____
   _____

2. Have you ever performed resistance (weight) training exercises in the past?
   Yes _____ No _____

3. Do you have injuries (bone or muscle disabilities) that may interfere with exercising? Yes _____No _____ If yes, briefly
   describe_____

4. List of Medications:

   _____
   _____
   _____
   _____

5. Have you fallen in the past year? _____ yes _____no

   a. If "yes," how many times? _____

   b. If "yes," were you injured? _____

6. Do you feel unsteady when standing or walking? _____ yes _____no

7. Do you feel worried about falling? _____yes _____no

Appendix O: Borg Rating of Perceived Exertion (RPE) Scale

#	Level of Exertion
6	No exertion at all
7	
7.5	Extremely light (7.5)
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

(CDC, 2015a)