

THE EFFECTS OF GUIDED RELAXATION AND EXERCISE IMAGERY ON
OLDER ADULTS WITH A FEAR OF FALLING

A Dissertation
Submitted to
The Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree
DOCTOR OF PHILOSOPHY

By
Bang Hyun (Bryan) Kim

May 2009

©

Copyright

2009

By

Bang Hyun (Bryan) Kim

ABSTRACT

The effects of guided relaxation and exercise imagery on
older adults with a fear of falling

By Bang Hyun (Bryan) Kim

Doctor of Philosophy

Temple University, 2009

Doctoral Chair: Michael Sachs, PhD

Fear of falling (FOF) is a major health care concern within the elderly population. The main purpose of this study was to examine the effects of a six-week intervention that used Guided Relaxation and Exercise Imagery (GREI) techniques on lowering FOF rates among community dwelling adults aged 60 and above.

A total of 184 older adults (mean age = 73.2) participated in a series of mobility (TUG; SLS) and FOF measures (1QFOF; Short FES-I; ABC Scale; EII). Participants were divided into four groups: two placebo control groups (PCG) and two intervention groups (IG). The intervention groups received instructions to use an audio CD containing a GREI program for 10 minutes a day, two times a week for six weeks. The control group received an audio CD that contained two relaxation tracks and were

instructed to listen to music of their choice for five minutes after listening to a relaxation track.

Through simple paired t-test and ANCOVA analysis, results revealed that the GREI CD had significant effects in reducing FOF (78%) and significantly increasing exercise imagery rates, efficacy in falls related activities, perceived exercise levels, and reducing time in a mobility test (e.g., TUG). There was also a significant reduction in FOF (20%) and significant increases in exercise imagery rates, efficacy, confidence, and a mobility test (e.g., TUG) for participants who had an FOF pretest and were in PCG. However, participants who were in PCG and did not have an FOF during pretest did not have significant differences in any of the tests except for a significant increase in falls efficacy.

Overall, this study revealed that using a GREI CD for six weeks helped decrease levels of FOF for older adults aged 60 and above. GREI was also effective in increasing falls-related efficacy, exercise imagery, and perceived exercise levels. Further exploration of GREI and its effects on psychological variables related to FOF and falls may substantiate its effectiveness as a fear of falling intervention.

ACKNOWLEDGEMENTS

I first and most importantly want to thank my Savior for being my rock and redeemer, answering my thoughts and prayers during the hardest times, and giving me the inspiration to complete this study. I want to thank my dissertation committee members, Drs. Michael Sachs, Roberta Newton, Ricky Swalm, and Joseph DuCette for their precious time and kind feedback. I want to give a very special thanks to my advisor Dr. Michael Sachs for being the best mentor a doctoral student can have. I also want to acknowledge his endless insight, feedback, and care. I think it would have been impossible to have completed this dissertation without his green pen. Also a very special thanks to Dr. Roberta Newton for sharing her wisdom, great ideas, words of encouragement, and being such a wonderful mentor. I want to give special thanks to Dr. Joseph Glutting for driving all the way from Delaware to meet and help me with my data analysis. I also want to thank Dr. Peter Giacobbi for his wonderful idea and support to help me start this study.

I want to give thanks to the senior center directors and church pastors for their permission to recruit participants. I also want to thank all the participants

for their precious time and feedback. Without them, there would have been no study. I want to give a special thanks to Mrs. Materson for sharing her lovely stories throughout the testing. I really enjoyed getting to know her and I hope she is having the time of her life with her dog in a better place.

I would like to give thanks to my family for their unconditional love and support. I would like to give special thanks to my one and only nuna, as without her motivational speech, I would have never completed this study. I want to thank Dr. Michael Sitler and John Susko for being such great bosses. I want to thank Sean Conran, Jeanette Butkiewicz, Linda Muraresku for their kind support and help throughout my years here. I want to thank colleagues and friends, Elizabeth Loughren, Gloria Park, Caitlin Monks, Tori DeTollo, Kristin Gavin, Jennè Massie, Aaron Ross, and many others. I want to thank my Renewal brothers Edwin Yang, Dan Choi, "Delaware" Dave Lee, and Abe Kim for being great friends and keeping me in sync when I needed to. Lastly, I want to thank my brothers and sisters at Renewal Presbyterian Church for teaching me that there is a God, providing me a community, and kind support and help throughout my years here in Philadelphia.

TABLE OF CONTENTS

	Page
ABSTRACT.....	iii
ACKNOWLEDGEMENTS.....	v
LIST OF TABLES.....	xi
LIST OF FIGURES.....	xiv
CHAPTER	
1. THE PROBLEM.....	1
Purpose.....	8
Hypotheses.....	8
Delimitations.....	10
Limitations.....	11
Definition of Terms.....	12
2. REVIEW OF LITERATURE.....	15
Fear of Falling (FOF).....	15
Measurement Tools in Fear of Falling.....	17
The One Question Fear of Falling Measure (1QFOF).....	18
The Falls Efficacy Scale (FES).....	19
The Activities-specific Balance Scale (ABC).....	24
The Survey of Activities and Fear of Falling in the Elderly (SAFFE).....	28
The Relationship Between Self-Efficacy and Fear of Falling.....	29
Introduction to Mental Imagery.....	31
Theories of Mental Imagery.....	33
Psychoneuromuscular Theory.....	33
Symbolic Learning Theory.....	34
Bioinformational Theory.....	37
Dual Coding Theory.....	39
Functions of Imagery.....	42
Variables Influencing the Use of Imagery.....	49
Gender Differences in the Use of Imagery.....	49
Imagery Ability.....	50
Types of Imagery.....	52

Internal Imagery.....	52
External Imagery.....	52
Exercise Imagery.....	53
Measurement Tools Used in Exercise Imagery.....	59
Exercise Imagery Questionnaire(EIQ).....	59
Exercise Imagery Inventory(EII).....	61
The Relationship Between Self-Efficacy And Exercise Imagery.....	63
Imagery Use in Middle-Aged and Older Adult Exercisers.....	68
Mind-Body Therapies.....	76
Progressive Muscle Relaxation (PMR).....	77
Hypnosis.....	78
Tai Chi.....	78
Yoga.....	79
Guided Imagery(GI).....	79
Summary.....	83
3. METHODOLOGY.....	85
Research Design.....	85
Participants.....	89
Instrumentation.....	91
Exercise Imagery Inventory (EII).....	92
Activities-specific and Balance Confidence Scale (ABC).....	92
Short Falls Efficacy Scale - International Version (Short FES-I).....	93
Leisure Time Exercise Questionnaire (LTEQ).....	95
Timed Up and Go (TUG).....	95
One Leg Stance (OLS).....	97
Placebo Control and Intervention Groups.....	99
Group 1: Fear of Falling - Placebo Control Group (FOF - PCG).....	99
Group 2: Fear of Falling - Intervention Group (FOF - IG).....	100
Groups 3 and 4: No Fear of Falling - Intervention Group (No FOF - IG) and No Fear of Falling - Placebo Control Group (No FOF - PCG).....	103
Procedures.....	103
Pilot Study.....	109
Procedures for Pilot Study.....	110
Results for Pilot Study.....	114
Final Remarks/Comments.....	116
Data Analysis.....	117

4. RESULTS AND DISCUSSION.....	121
Demographic Information.....	121
Results from	
Demographic/Screening Form.....	123
Results for Research Hypotheses.....	128
Research Hypothesis 1.....	128
Research Hypothesis 2.....	130
Research Hypothesis 3.....	134
Research Hypothesis 4.....	139
Research Hypothesis 5.....	143
Research Hypothesis 6.....	151
Discussion for Research Hypotheses.....	155
Research Hypothesis 1.....	155
Research Hypothesis 2.....	158
Research Hypothesis 3.....	161
Research Hypothesis 4.....	163
Research Hypothesis 5.....	164
Research Hypothesis 6.....	168
General Discussion.....	171
Implications for Researchers.....	176
Implications for Practitioners.....	179
5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR	
FUTURE RESEARCH.....	183
Summary.....	183
Conclusions.....	187
Recommendations for Future Research.....	190
REFERENCES.....	195
APPENDICES	
A. INFORMED CONSENT.....	219
B. DEMOGRAPHICS/SCREENING FORM.....	226
C. EXERCISE IMAGERY INVENTORY (EII).....	228
D. THE ACTIVITIES SPECIFIC BALANCE	
CONFIDENCE SCALE (ABC).....	226
E. Short FALLS EFFICACY SCALE - INTERNATIONAL	
VERSION (Short FES-I).....	228
F. LEISURE TIME EXERCISE QUESTIONNAIRE (LTEQ).....	231
G. INSTRUCTIONAL BOOKLET FOR CONTROL GROUP (CG).....	232
H. CHECKLIST FOR CONTROL GROUP (CG).....	236
I. INTRODUCTION DRAFT TO GREI CD.....	238
J. VIVIDNESS/CONTROLLABILITY EXERCISE.....	240
K. PROGRESSIVE MUSCLE RELAXATION (PMR) SCRIPT.....	241

L. DEEP BREATHING SCRIPT.....	242
M. GREI CD IMAGERY DRAFTS (EXAMPLES).....	243
N. INSTRUCTIONAL BOOKLET FOR INTERVENTION GROUP (IG)....	249
O. CHECKLIST FOR INTERVENTION GROUP (IG).....	252
P. TRUST AGREEMENT LETTER.....	254

LIST OF TABLES

1.	GREI CD Track List.....	101
2.	Overall Procedure.....	108
3.	Demographic Information for Pilot Study.....	110
4.	Overview Procedures of Pilot Study.....	113
5.	Results for Pilot Study.....	114
6.	Data Analysis for Pilot Study.....	115
7.	Demographic Information.....	122
8.	Results of Demographic/Screening Form.....	125
9.	Results of 1QFOF.....	129
10.	Paired Sample t-test for 1QFOF.....	129
11.	Pretest and Posttest Mean Scores and Standard Deviations for the Short FES-I.....	130
12.	Paired Samples t-test for the Short FES-I.....	132
13.	ANCOVA for the Short FES-I.....	132
14.	Posttest Mean Scores for Unadjusted and Adjusted Short FES-I Values Among the Four Groups.....	133
15.	Post Hoc Testing for the Short FES-I Post Mean Scores.....	134
16.	Pretest and Posttest Mean Scores and Standard Deviations for the ABC-Scale.....	135
17.	Paired Samples t-test for the ABC Scale.....	136
18.	ANCOVA for the ABC Scale.....	137
19.	Posttest Mean Scores for Unadjusted and Adjusted ABC Values Among the Four Groups.....	137
20.	Post hoc testing for the ABC Scale Post Mean Scores.....	138

21. Pretest and Posttest Mean Scores and Standard Deviations for the EII.....	139
22. Paired Samples t-test for the EII.....	140
23. ANCOVA for the EII.....	141
24. Posttest Mean Scores for Unadjusted and Adjusted EII Values Among the Four Groups.....	142
25. Post hoc testing for the EII Post Mean Scores.....	143
26. Pretest and Posttest Mean Time (in Seconds) and Standard Deviations for the TUG an OLS.....	144
27. Paired Samples t-test for the TUG.....	145
28. ANCOVA for the TUG.....	146
29. Posttest Mean Times for Unadjusted and Adjusted TUG Values Among the Four Groups.....	146
30. Post hoc testing for the TUG Post Time Scores.....	147
31. Paired Samples t-test for the OLS.....	149
32. ANCOVA for the OLS.....	149
33. Posttest Mean Times for Unadjusted and Adjusted OLS Values Among the Four Groups.....	150
34. Post hoc testing for the OLS Post Time Scores.....	151
35. Pre and Posttest Mean Scores and Standard Deviations for the LTEQ.....	152
36. Paired Samples t-test for the LTEQ.....	153
37. ANCOVA for the LTEQ.....	154
38. Posttest Means for Unadjusted and Adjusted LTEQ Values Among the Four Groups.....	154
39. Post hoc testing for the LTEQ Post Mean Scores.....	155

40. Mean Scores of the Short FES-I According to Falls History and Fear of Falling.....	159
41. Overall Pretest and Posttest Mean Scores/Times for all the Groups.....	172

LIST OF FIGURES

1. Overall Research Design.....	86
2. Short FES-I Pretest and Posttest Mean Scores for all Groups.....	131
3. ABC Scale Pre and Posttest Mean Scores for all Groups.....	135
4. EII Pretest and Posttest Mean Scores for all Groups.....	140
5. TUG Pretest and Posttest Mean Times for all Groups.....	146
6. OLS Pretest and Posttest Mean Times for all Groups.....	148
7. LTEQ Pretest and Posttest Mean Times for all Groups.....	152

CHAPTER 1

INTRODUCTION

The Problem

Falls are the leading cause of injury-related death, and the third leading cause of poor health among people aged 65 years and above (Evitt & Quigley, 2004). Overall, about one-third of older adults in the world experience a fall annually (Campbell, Reinken, Allan, & Martinez, 1981; Prudham & Grimley-Evans, 1981; Tinetti, Speechley, & Ginter, 1998) and the occurrence of falls increases as an adult ages and becomes frail (Speechley & Tinetti, 1991). Falls are consequently the most common cause of accidental injury among older people, which in turn can lead to permanent loss of mobility and even death (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopedic Surgeons Panel on Falls Prevention, 2001; Todd et al., 1995).

Although the majority of falls do not lead to serious injury or death (Lilley, Arie, & Chilvers, 1995; O'Loughlin, Robitaille, Boivin, & Suissa, 1993), older adults who do survive from falls may experience a number of complications, including restricted activity, soft tissue injuries, and

fractures (Baker & Harvey, 1985; Gryfe, Amies, & Ashley, 1977; Tinetti & Williams, 1994). More research suggests that older people, both fallers and non-fallers, may experience psychological difficulties related to falls (Maki, Holliday, & Topper, 1991; Tinetti et al., 1988; Tinetti, Mendes de Leon, Doucette, & Baker, 1994; Tinetti, Richman, & Powell, 1990; Walker & Howland, 1991). The psychological consequences related to falling, or the anticipation of sustaining a fall, may be as debilitating as, and sometimes more debilitating than, the actual fall itself (Cumming, Salkeld, Thomas, & Szonyi, 2000; Salkeld et al., 2000). The psychological difficulties are often recognized as fear of falling (Cameron et al., 2000; Howland et al., 1993; Kressig et al., 2001; Lachman et al., 1998; Li et al., 2002; Simpson, 2003; Tinetti et al., 1990; Velozo & Peterson, 2001; Yardley & Smith, 2002), loss of self-efficacy (Arai et al., 2007; Cameron et al., 2000; Kempen et al., 2007, 2008; Lachman et al., 1998; Li et al., 2002; Li, Fisher, Harmer, & McAuley, 2005; Myers et al., 1996; Powell & Myers, 1995; Simpson, 2003; Tinetti et al., 1990; Tinetti et al., 1994), activity avoidance (Tinetti et al., 1990; Yardley & Smith, 2002), and loss of confidence (Powell & Myers, 1995).

Out of all the psychological difficulties, Fear of Falling (FOF) was identified as the most common among community-dwelling adults (Howland et al., 1993). Approximately 50% of community-dwelling older adults experience an FOF (Fletcher & Hirdes, 2004; Howland et al., 1998; Tinetti et al., 1990; Yardley & Smith, 2002). The experience of a fall might be a plausible reason that older adults develop an FOF, but FOF is also prevalent for non-fallers (Friedman, Munoz, West, Rubin, & Fried, 2002). Therefore, it is possible that factors such as the process of aging, physical frailty, or other social factors, such as hearing that a friend experienced a detrimental fall, might also contribute to the development of FOF (Zijlstra et al., 2007). Several studies have shown that adults who have an FOF appear to have lower confidence (Lachman et al., 1998), which leads to habitually restrict the amount or type of physical activity they would usually do (Tinetti et al., 1990, 1994), and a loss of independence (Lachman et al., 1998) which in the end might possibly lead to further falls (Spano & Forstl, 1992).

In addition to these consequences, there are consequences for public expenditure, because health care costs increase due to the debilitating effects of FOF (Cumming et al., 2000) and the effects of falling. It is

therefore important to find ways to reduce FOF by reversing the fear to no fear and finding inexpensive and effective interventions to lower and even prevent FOF (Zijlstra et al., 2007).

In the past decade, many studies have assessed the effectiveness of interventions on FOF (Zijlstra et al., 2007). In a recent systematic review done by Zijlstra and colleagues (2007), out of 599 abstracts and 19 papers reviewed, interventions that showed effectiveness in reducing FOF rates were community based tai chi, home-based exercise, and home-based fall-related multi-factorial interventions. This review, overall, found consistent findings in reducing FOF in community living people in trials of high methodological quality, but few of these studies have investigated the underlying mechanisms that may produce such effects (Li et al., 2005).

In the past, different concepts such as FOF and fall-related self-efficacy have been applied to describe and measure the psychological aspects of falling (Jorstad, Hauer, Becker, & Lamb, 2005). Fear of falling and self-efficacy may not be considered to be the same construct, but an increase in self-efficacy assessed as balance confidence (Powell & Myers, 1995) can act as a mediator to reduce FOF (Li et al., 2005). This underlines the need to

create an intervention that can help identify causal pathways between treatment and outcome, and possible ways a treatment might achieve its effects (Kraemer, Wilson, Fairburn, & Agras, 2002).

An effective and practical tool that can be used to increase self-efficacy and decrease FOF rates might be Guided Relaxation and Imagery (GRI). GRI is a simple, low to no cost therapeutic tool that can help counteract fear and anxiety of an individual (Tusek, Church, & Fazio, 1997). Physiologically, GRI has been shown to help lessen autonomic nervous system responses (Benson, Beary, & Carol, 1974; Lang, 1979), reduce skeletal muscle contraction, uncomfortable sensations, and other responses to stress (Benson, 1975), making it a possible alternative tool for adults who have an FOF and cannot perform the physical activities recommended by successful FOF intervention studies such as home-based exercises or tai chi.

According to Wolsko, Eisenberg, Davis, and Phillips (2004), GRI is the third most commonly used mind-body therapy in the United States. It is a therapeutic tool designed to ease anxiety levels and promote relaxation. Naprastek (1994), a pioneer in guided imagery, described it as a process of using imagination to help the mind and body heal, stay well, or perform well. Guided Imagery involves

the use of verbal instructions to create a flow of thoughts that focus the individual's attention on imagined visual, auditory, tactile, or olfactory sensations. Relaxation is an essential addition to guided imagery as relaxation allows more total concentration on the sensory sensations (Baird & Sands, 2006).

In general, GRI has been proven to be an effective therapeutic tool in research. Some successful GRI interventions in research are: helping with smoking cessation (Wynd, 2005), improving the quality of life in cancer patients (Luebbert, Dahme, & Hasenbring, 2001), reducing stress and anxiety for patients undergoing chemotherapy (Walker et al., 1999), reducing fear in dental treatment (Willumsen, Vassend, & Hoffart, 2001), reducing fear of flying (Wiederhold et al., 2002), and reducing fear of snakes (Hunt et al., 2006). Although there has been numerous research done in GRI, not much research has been done with GRI in the older population (Morone & Greco, 2007). In particular, there has been no research done with FOF. With the numerous benefits of GRI and the results from previous research, GRI might be able to help adults who have an FOF.

Specifically, for the purposes of this study, Guided Relaxation and Exercise Imagery (GREI) was used as an intervention tool. Recently, research has shown that exercise imagery has motivational and cognitive functions but until now there have been no studies using exercise imagery as an intervention tool. Rather, all of the previous exercise imagery studies have been exploratory, to see how exercisers use imagery. Therefore, this study was the first to address if GREI helped decrease levels of FOF and if exercise imagery was an effective tool in an intervention. Because exercise imagery has been shown to increase efficacy and confidence levels (Giacobbi, 2007; Hall, 1995), the question of whether GREI increased levels of efficacy, confidence, and imagery use in older adults who have an FOF was also examined in this study.

The advantage of exercise imagery over other intervention tools is that it can be used after the study has been completed with little or no costs or physical skill required. Therefore, the ultimate goal was to teach older adults who have an FOF to use relaxation and imagery for their benefit. Hopefully by teaching them how to use relaxation and imagery, their FOF levels will decrease and their confidence and motivation to do activities or physical skills will increase.

Purpose

The main purpose of this study was to examine the effects of a six-week intervention that used Guided Relaxation and Exercise Imagery (GREI) techniques on lowering Fear of Falling (FOF) rates among community dwelling adults aged 60 and above. A secondary purpose was to study the effects of GREI techniques on self-efficacy, self-confidence, exercise imagery use, perceived exercise levels, and specific simple mobility tests.

Research Hypotheses (RH)

The following research hypotheses were examined in this study:

RH1. There will be a significant decrease in FOF levels by a six-week intervention program using GREI techniques for Group 2 (Fear of Falling - Intervention Group). There will be no significant differences for Groups 1 (Fear of Falling - Placebo Control Group), 3 (No Fear of Falling - Intervention Group), and 4 (No Fear of Falling - Placebo Control Group). For the purposes of this study, the 1 Question Fear of Falling (1QFOF) was used to examine if there was a significant change in FOF among the groups.

RH2. GREI techniques will result in a significant improvement in self-efficacy for Group 2. There will be no significant differences for Groups 1, 3, and 4. For the purposes of this study, the Short FES - I (Kempen et al., 2008) was used to measure efficacy levels in relation to FOF.

RH3. GREI techniques will result in a significant improvement in confidence only in Group 2. Confidence in doing daily activities without a fear of falling was measured by using the Activities Balance and Confidence Scale (ABC Scale; Powell & Myers, 1995).

RH4. Participants will have significantly higher exercise imagery usage rates after the intervention for Groups 2 and 3. There will be no significant difference for Groups 1 and 4. The use of exercise imagery was measured by using the Exercise Imagery Inventory (EII; Giacobbi et al., 2005).

RH5. There will be a significant difference of time (seconds) in the mobility tests assessed from before to after the study only in Group 2. Mobility tests in this study were the Timed Up and Go (TUG; Podsiadlo & Richardson, 1991; Shumway-Cook, Brauer, & Woollacott, 2000) and the One Leg Stance (OLS; Berg, Wood-Dauphinnee, Williams, & Gayton, 1989).

RH6. There will be significant increases in participants' perceived duration and intensity of exercise levels assessed from before to after the study for Groups 2 and 3. There will be no significant differences in Groups 1 and 4. This was examined by using the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985)

Delimitations

The study was delimited as follows:

1. All participants were aged 60 and above.
2. All participants were recruited from local senior centers and churches in a large urban area.
3. All participants were placed in one of the two groups by the author, according to whether they did or did not have a fear of falling. For each of the two groups (FOF, and no FOF), subjects were randomly placed into a control group or an intervention group.
4. Participants were given either an audio compact disk (CD) with relaxation tracks (placebo control group) or an audio GREI CD (intervention group). The CD comes with an instruction booklet participants were asked to follow. A checklist was also given to monitor their progress with the CD.

5. A trust agreement letter was obtained from each participant explaining that they listened to the CD for six weeks, two times a week, and once a day for 10 minutes.

Limitations

The study has the following limitations:

1. Due to the random selection for the groups, the groups were not evenly distributed by gender or by age.
2. Not all the participants may have answered the questionnaires correctly or honestly.
3. There might be a Hawthorne effect in participants' responses to the questionnaires.
4. Not all the participants followed the instructions which accompanied the audio compact disk.
5. Due to the small and selective sample, it is hard to generalize the results to a larger population.
6. The audio GREI CD may not be personalized for some participants; therefore, some participants might have had a hard time getting inspired.
7. The location of the pretest and posttest differed for each participant so the environment might have affected their scores on the questionnaires and times on the mobility tests.

Definitions of Terms

For the purposes of this study, the following terms were defined:

Confidence. Confidence is defined by Dictionary.com (2008) as a full trust, belief in the powers, trustworthiness, or reliability of a person or thing. It may also be related to self-confidence, which is the belief in oneself and one's powers or abilities. Confidence of doing daily activities without an FOF was measured in this study by using the Activities Balance and Confidence Scale (ABC Scale; Powell & Myers, 1995).

Exercise Imagery. Exercise imagery is defined as a quasi-sensory experience that mimics a real event, activity, or exercise (Hall, 1995). It echoes or reconstructs an actual exercise experience, such as one's past, present, or future experience. The use of exercise imagery levels was measured in this study by using the Exercise Imagery Inventory (EII; Giacobbi et al., 2005).

Falling. A fall is when an individual comes to rest at a lower level, usually with a body contact with the ground, floor, furniture, or wall (Tideiksaar, 2002). Falls can be unintentional, inadvertent, involuntary, or accidental. Falls can also occur due to acute medical events or from environmental hazards and disease related symptoms.

Fear of Falling (FOF). Fear of Falling (FOF) is defined as a continuing concern about falling that can lead an individual to avoid activities that he or she remains capable of performing (Legters, 2002). Fear of falling can come from individuals who have or have not had a falling experience (Friedman et al., 2002). Other factors such as social withdrawal, loss of mobility, and loss of independence can contribute to the consequences of FOF. Many questionnaires are used to measure FOF, but for the purposes of this study, the 1QFOF was used.

Guided Imagery (GI). GI is defined as a process of using imagination to help the mind and body heal, stay well, or perform well (Naprastek, 1994). GI involves the use of verbal instructions to create a flow of thoughts that focus the individual's attention on imagined visual, auditory, tactile, olfactory, gustatory, or kinesthetic sensations.

Guided Relaxation and Exercise Imagery (GREI). This tool was created specifically for this study by the author. GREI is a technique for giving a participant a 5 to 10 minute guided relaxation that is directly followed by a 5 to 10 minute exercise specific imagery session. Guided relaxation is an essential addition to guided imagery, as it helps to allow total concentration on the sensory sensations and has been used together in many guided imagery studies (Klaus et al., 2000).

Mental Imagery. Mental imagery is defined as the ability to represent perceptual states in the absence of the appropriate sensory input (Finke, 1989; McKellar, 1957). It is a visualization of an image without experiencing the real thing.

Self-Efficacy. Self-Efficacy is defined as beliefs in one's capabilities to organize and execute the courses of action required to produce a given accomplishment and plays an important role in explaining human motivation and behavior (Bandura, 1986). For the purposes of this study, the Short FES - I (Kempen et al., 2008) was used to measure efficacy levels in relation to FOF.

CHAPTER 2

REVIEW OF THE LITERATURE

The review of literature starts with a brief introduction to Fear of Falling (FOF) including the definition, prevalence, past research, and the etiology of FOF. The following sections are presented: the measurement tools used in FOF, relationship between self-efficacy (SE) and FOF, introduction to mental imagery, theories of mental imagery, functions of imagery, variables influencing the use of mental imagery, types of imagery, introduction to exercise imagery, measurements tools used in exercise imagery, the relationship between SE and exercise imagery, and the introduction to mind body therapies with an in depth look at guided imagery.

Fear of Falling (FOF)

Fear of falling is a common and rising concern in elderly people (Howland et al., 1993; Lawrence et al., 1998; Legters, 2002). In past research, FOF was believed to be a result of the psychological trauma of a fall, also explained in chapter one as the 'post-fall syndrome' (Legters, 2002). This syndrome was first cited by Murphy and Isaacs (1982), who noticed that ambulatory people who

fall develop an intense fear of walking and walking disorders. Fear of falling has been identified as one of the key symptoms of this syndrome (Scheffer et al., 2008). Since that time, FOF has been an emerging health problem among older adults. However, as discussed in chapter one, fear of falling can be reported by people who have had a previous episode of falls but it can also occur to people who have not had an episode of a fall (Arken et al., 1994; McCormack et al., 2004; Tinetti et al., 1994). In a compilation of recent studies, results have shown that at least 25% of older people report fear of falling, with higher percentage for people who have fallen and live in institutional settings (Arken et al., 1994; Bruce, Devine, & Prince, 2002; Howland et al., 1998; Tinetti et al., 1994; Franzoni, Rozzini, Boffelli, Frisoni, & Trabucchi, 1994; Liddle & Gilleard, 1995).

According to a systematic review that researched 28 studies concerning measurements, prevalence, risk factors, and consequences of FOF in people aged 65 or older by Scheffer and colleagues (2008), different variations of the FOF definition resulted in many different measurements in FOF. According to Scheffer et al., most studies reviewed used multi-item tools measuring the construct of self-efficacy such as the Falls Efficacy Scale (FES) and the

Activities-specific Balance and Confidence scale (ABC). Prevalence of FOF found in these studies ranged from 3 - 85%. Also, 50% of the prevalence rate came from people who never experienced a fall. This shows that high prevalence rates are also found in non-fallers and according to Scheffer et al. (2008) and the main risk factor of FOF was having at least one fall. Higher prevalence of FOF was also found to be in women and appeared to increase with age (Scheffer et al., 2008). Previous research has shown that FOF is associated with negative consequences such as falling, less physical activity, restriction, depression, decreased social contact, and lower quality of life (Legters, 2002; Scheffer et al., 2008).

Measurement Tools in Fear of Falling

There have been many tools that have been developed over the past two decades to measure FOF. These measures use different FOF definitions and premises. In the following sections, tools that have been most commonly used in FOF are reviewed: a) The One-Question Fear of Falling Measure (1QFOF), b) Falls Efficacy Scale (FES), c) Activities-Specific Balance Confidence Scale (ABC Scale), and d) the Survey of Activities and Fear of Falling in the Elderly (SAFE).

The One-Question Fear of Falling Measure (1QFOF)

Many researchers in early studies of FOF asked the simple question "are you afraid of falling?" With a "yes/no" or "fear/no fear" response format (Arfken et al., 1994; Howland et al., 1993, 1998; Maki, 1997; Maki et al., 1991; McAuley et al., 1997; Murphy et al., 2002; Murphy & Issacs, 1982; Myers, Powell, & Maki, 1996; Tinetti et al., 1990; Tinetti & Powell, 1993). This measure has the advantages of being simple, straightforward, and easy to generate prevalence estimates (Legters, 2002).

Although this measure has been helpful to identify FOF, it has been criticized for not measuring the intensity of fear and it may generalize a state of fear that does not directly reflect FOF (Howland et al., 1993; Lawrence et al., 1998). In later studies, researchers expanded the answer choices to provide a hierarchy of responses (e.g., not afraid at all, slightly afraid, somewhat afraid, very afraid) to better reflect the intensity of the fear (Arfken et al., 1994; McAuley et al., 1997; Lawrence et al., 1998).

Lawrence and colleagues (1998) used this measure to study correlates of FOF. They used the 1QFOF to identify the intensity of FOF that individual had falling in the next year. The response format was based on a four-point scale with the following answers: "not afraid at all,"

"slightly afraid," "somewhat afraid," and "very afraid." Results of this study showed that lower levels of FOF and becoming injured within the next year were related to being younger, lower levels of dysfunction, and higher levels of perceived ability to manage falls. Other researchers have continued to use this tool as a simple question to screen FOF in community dwelling adults (Myers et al., 1996; Powell et al., 1995).

Overall, this measure is a popular instrument used by many researchers because it is easy to use, easy to answer for older adults, especially those with cognitive problems, quick effective instrument that can be used in large samples for screening purposes, and strong relations with different FOF measures, such as the FES, and the ABC Scale.

The Falls Efficacy Scale (FES)

Tinetti and colleagues (1990) developed this measure to examine if older adults who had a FOF could be measured by looking at fall-related self-efficacy or a person's self-confidence in one's ability to avoid falling while performing daily activities. There are 10 questions on the scale such as, "How confident are you that you can take a bath or shower without falling?"

Participants rate each question on a scale from 1 to 10, with lower scores indicating higher levels of confidence. The total score is given from 0 to 100.

Many studies have used this measure to correlate self-efficacy and falling. Powell and Myers (1995) compared the FES to a scale they were developing, the ABC scale. Results showed a 0.90 Cronbach's alpha for the FES, making it acceptable in internal consistency. FES scores also showed discriminate validity, with highly functional participants having a higher FES score than low functional subjects.

Although the FES has been shown to be a reliable and valid FOF measurement, a couple of limitations can be stated. First, the items on the FES refer almost completely to basic activities of daily living that are too easy for healthy people. It does not include more complex activities that may be more demanding for older people who are high functioning. This limitation causes the scores to usually have a ceiling effect (most of the scores are near the maximum score) making it difficult to create an intervention or a follow up study for FOF.

Second, none of the items list the impact of fear of falling in social circumstances. Since the FES measures only simple indoor routine activities of daily living, some

researchers claim that it may be only useful to older adults who have low functional capabilities (McAuley et al., 1997; Myers, Fletcher, Myers, & Sherk, 1998). Lastly, there was not a direct relationship between fear of falling and self-efficacy or confidence in doing activities without falling in the original FES (McKee et al., 2002). In addition, it was suggested that the 10-category discrimination between levels of confidence made responses to the FES lack meaningfulness to older people, who may find it difficult to discriminate between 30% or 40% level of confidence that they will not fall (Lachman et al., 1998)

To solve some of the limitations of the FES, Yardley and colleagues (2005) created a measurement called the Falls Efficacy Scale-International (FES-I). The main purpose of the development of the FES-I was to modify the FES to maximize its suitability to translation and apply it to a wide range of different languages and cultural contexts. The FES-I was also developed to assess fear concerns about demanding activities outside the home using cross-culturally valid items that were not included in the original FES (Yardley et al., 2005). The FES-I was developed through several meetings between members of the Prevention of Falls Network Europe (ProFaNE) and through

cross-cultural face validity to assess more difficult and social activities from past research (Yardley et al.).

From the results, a total of 16 items, including 10 items from the original FES, were used in the final development of the FES-I. The six new items were walking on slippery, uneven or sloping surfaces, visiting friends or relatives, and going to a social event or to a place with crowds.

Overall, the FES-I showed excellent psychometric properties, and has been translated and used in 14 different languages using a standardized translation protocol (Kempen et al., 2007).

In 2008, Kempen and colleagues created a shortened version of the FES-I called the Short FES-I, arguing that the FES-I might be too long and researchers might be interested in a briefer instrument, especially when it is used as part of many other scales for screening purposes. Also, the high internal consistency of the FES-I suggested the redundancy of the questions. The Short FES-I included seven items out of the original 16. The seven items were chosen from a combination of face validity and psychometric criteria. The first criterion was that all items must be able to discriminate between participants reporting no falls, one fall, or more than one fall within the past year (Kempen et al., 2008). Items like 'cleaning the house' and

'preparing simple meals' were excluded because it did not significantly discriminate between people with no falls or one fall (Yardley et al., 2005). The second criterion was to assess the full range of levels of fear, and that the Short FES-I must include a balanced range of items that assessed low, medium, and high levels of fear in some people (Kempen et al., 2008).

After the items were chosen, an internal reliability check was done showing a Cronbach's alpha of 0.92. After creating the Short FES-I, Kempen and colleagues compared their version to the original FES-I. Results showed a Spearman correlation of 0.97 between the FES-I and the Short FES-I. Also, results showed that the shorter version of the FES-I was highly comparable with the 16 item FES-I with respect to internal, test-retest reliability, and discriminative power. In contrast to the FES, both the FES-I and the Short FES-I include physically more demanding activities outside the home such as "going out to a social event."

Overall, Kempen and colleagues concluded that the FES-I gives more information about the range of activities that are feared, is better at discriminating between sub-groups, and might be more sensitive to change. The Short FES-I is a good alternative in settings when less time for assessment is available or participants are less able to fill out long questionnaires.

The Activities-specific Balance Scale (ABC Scale)

The ABC scale was developed by Powell and Myers (1995) to measure an aspect of psychological impacts of falls. The ABC scale was administered to older adults with higher functioning abilities based on the self-efficacy theory reported by Tinetti and colleagues (1990). It is a 16 item questionnaire that asks a participant to rate his or her confidence level in performing each of the activities given on a scale from 0 (no confidence) to 100% (complete confidence) without losing balance or becoming unsteady. An average percentage for each of the 16 items is calculated. According to Myers and colleagues (1998), participants who scored between 90 - 100% were considered healthy. The ABC scale included activities and conditions that were more specific than those of the FES to decrease the variation of the individual's understanding of the question. The ABC scale also included activities that were

performed outside the home and were more difficult than the FES (e.g., riding an escalator while holding onto the railing). By adding more specific and difficult tasks, the ABC reduced ceiling effects that were problematic in the FES.

In 2004, Lajoie and Gallagher tested the sensitivity and specificity of the ABC scale in predicting falls in community-dwelling older adults. They also created cut-off scores with regards to reaction time, the Berg balance scale, the ABC scale, and the postural sway to monitor fall status for older adults. There were 125 subjects (45 fallers and 80 non-fallers) and results indicated that non-fallers have significantly faster reaction times, have higher scores on the Berg balance scale and the ABC scale as well as slower sway frequencies to fallers. Results also revealed a cut-off score of 67% on the ABC resulted in 84% sensitivity and 87% specificity in correctly classifying fallers and non-fallers.

Kressig and colleagues (2001) studied community-dwelling older adults transitioning to frailty by using both the ABC scale and the FES. They wanted to find if there were significant associations between demographic, functional, behavioral characteristics, and activity-related FOF measures by the ABC and the FES. Results showed

no statistically significant association found between activity-related fear of falling and age. For the activity-related measurements, about half (ABC, 48.1%; FES, 50.1%) of the subjects were concerned about falling or showed lack of confidence in controlling their balance. Also, a statistically significant inverse correlation was found between FES and ABC ($r = -0.65$; $p < .001$). African-American subjects showed more activity-related fear of falling than did Caucasians and fearful individuals were more likely to be depressed and more likely to report the use of a walking aid than non-fearful individuals. Fear of falling was significantly correlated to all of the functional measurements ($p < .05$). Overall, using a multivariable logistic regression model, depression, using a walking-aid, slow gait speed, and being an African-American were directly related to being more fearful of falling.

The ABC scale was able to differentiate older people who reported avoiding activity because of fear of falling from those who did not (Myers et al., 1996). Specifically, lower ABC scores meant lower levels of mobility (Powell & Myers, 1995) and falls (Lajoie & Gallagher, 2004). Barhameen (2005) found a distinct relationship between the ABC and the 1QFOF within an older minority population.

Results showed a significant difference between the "yes" and the "no" groups of the 1QFOF in terms of their mean ABC score ($F = 0.520, p < 0.001$), meaning that these tools measured a similar construct. Also, according to Barhameen, there was no overlap between the confidence intervals of ABC scores among the "yes" and the "no" group of the 1QFOF, suggesting that both tools were distinctive.

Li and colleagues (2003) argued that the ABC and the FES had too specific mobility tasks or physical activities that were hard to be generalized. Another limitation towards the ABC is that there are certain measures that an older adult might not be able to do at all (Barhameen, 2005). Older adults might be able to answer questions that rate their own confidence in dangerous situations such as walking on an icy sidewalk because they simply might not do it at all. In these situations, older adults might underestimate or overestimate their confidence levels (Lawrence et al., 1998) making it unreliable at times.

Overall, the ABC is a useful assessment tool for a range of groups (Hill, 2005). However, assessing the tool requires the participant to have reasonably intact cognition. Specifically, the participant must understand that the ABC measures the confidence in doing a particular activity and not how easily an activity can be performed.

The Survey of Activities and Fear of Falling in the Elderly (SAFE)

Lachman and colleagues (1998) created a measure focusing on the restriction of activity in FOF called the Survey of Activities and Fear of Falling in the Elderly (SAFE). This survey was created by using 270 participants from senior housing sites asking about their involvement in 22 basic and instrumental activities of daily living (IADL), social activities, and how a fall would affect their involvement in those activities. Through regression and internal consistency analysis, the tasks on the scale were reduced from 22 to 11. For each task, participants were asked a series of questions that asked about how worried or not worried they were to do the activity with or without a fall. SAFE scores were calculated by totaling the scores of each task. Specifically, scores were added by averaging item responses (ranging from 0 = not at all worried to 3 = very worried), with higher scores indicating greater fear of falling (Lachman et al., 1998).

Results showed that the SAFE was able to distinguish between older adults with various degrees of FOF and those who did or did not restrict their activity level. Previous research has also found that the SAFE correlated with the FES ($r = 0.76$) and with the 1QFOF ($r = 0.59$) suggesting

convergent validity (Barhameen, 2005). Limitations of the SAFE include a long time to complete the test in addition to the need to evaluate the reliability of measurements obtained with the SAFE.

Overall this tool showed FOF to be related to lower quality of life and an advantage of this measure over other FOF measures is differentiating fear of falling that leads to activity restriction from fear of falling that accompanies activity (Lachman et al., 1998). The authors also claimed that the SAFE might provide useful information for those interested in treating FOF and promoting activity among the elderly.

Li and colleagues (2002) showed that FOF (defined by SAFE) and falls efficacy (defined by ABC scale) were related but not the same construct, suggesting that the SAFE is a distinct FOF construct in measuring fear related to falls. Li and colleagues also showed that the SAFE was negatively correlated with falls self-efficacy (e.g., lower levels of FOF were significantly related to higher levels of self-efficacy).

The Relationship Between Self-Efficacy and Fear of Falling

Recently, fear of falling has often been studied within a self-efficacy framework (Li et al., 2005). Self-efficacy is defined by Bandura (1995, p. 2) as "one's

beliefs in capabilities to organize and execute the courses of action required to produce a given attainment and plays a central role in explaining human motivation and behavior." Self-efficacy has been studied in the area of fear of falling, which is referred to a personal belief in one's ability to engage in certain activities of daily living without falling or losing balance (Powell & Myers, 1995; Tinetti et al., 1990). Hence, fall-related measures such as the FES (Tinetti et al., 1990) have been developed based on this conceptual premise (Lawrence et al., 1998; McAuley et al., 1997; Powell & Myers, 1995; Tinetti et al., 1990). Accordingly, fall-related efficacy might be influenced by one's own experience and by witnessing the experiences of other people (Li et al., 2002). Fear of falling is expected to be moderated or weakly related to performing functional tasks, but the passageway mediated by falls efficacy is likely to be strong (Li et al.).

Past research has shown that self-efficacy plays a very important mediating role in exercise and fear of falling (Li et al., 2002, 2005). Li and colleagues (2005) examined if falls self-efficacy played a mediating role in exercise (Tai-Chi) and fear of falling. Two-hundred fifty six participants ages 70 and above participated in either a 6-month Tai-Chi program or a stretching control exercise

intervention, three times a week, for six consecutive months. The SAFE (Lachman et al., 1998) was assessed at baseline, at three months, and at the six-month termination of the intervention. Results showed that after a six month Tai-Chi program, participants had significantly improved scores on their falls self-efficacy, movement confidence, and balance control. The study also found an increase in efficacy beliefs by engaging in regular Tai Chi exercises, resulting in a decrease in fear of falling. This finding suggests Tai Chi as an important mediator of change in falls efficacy and indeed a crucial mechanism in the exercise and fear of falling relationship (Li et al.).

Introduction to Mental Imagery

Mental imagery resembles a perceptual experience but occurs in the absence of appropriate stimuli for the relevant perception (Finke, 1989; McKellar, 1957). Imagery is mostly known by echoes or reconstructions of actual perceptual experiences, such as one's past or future experiences (Thomas, 2001). Thus, imagery is strongly implicated in memory (Paivio, 1986; Yates, 1966), motivation (McMahon, 1973), and has been studied extensively in sport and physical activity settings (Feltz & Landers, 1983).

Researchers in the sport and exercise sciences often view imagery as a form of mental simulation (Weinberg & Gould, 2003) and it is often called visualization. Imagery has also been referred to as a quasi-sensory experience that mimics real events, situations or experiences (White & Hardy, 1998). We can be aware of an image, be able to feel movements or experience an image using all sensory modalities, without actually experiencing the real thing. Imagery differs from dreams because individuals are wide-awake and conscious when images are developed. Everyone has the ability to develop and use imagery, but people vary in the extent to which they are skilled or choose to use imagery (Hall, 2001).

Betts (1909) was perhaps the first to formally study mental imagery. He examined the spontaneous use of imagery in a variety of tasks, including simple association and discrimination judgments. Betts found that all of these tasks required mental imagery, but speculated that imagery might be more beneficial to some tasks than others. Since Betts' time there has been an enormous growth in mental imagery that will be reviewed in upcoming sections. What follows is a review of modern theories of mental imagery and studies that test these theories.

Theories of Mental Imagery

Psychoneuromuscular Theory

Carpenter (1894) proposed the psychoneuromuscular theory and proposed that imagery assists the learning of motor skills by innervating neuromuscular pathways in a manner similar to when individuals actually performed the activity. When someone vividly imagines an event, muscles show movement patterns similar to the way they would when actually performing the skill. While these neuromuscular movements are similar to those produced during actual performance, they are significantly lower in magnitude. Thus, although the magnitude of the muscle activity is reduced during imagery, the activity is a mirror image of the actual performance pattern.

According to Jacobson (1931), motor imagery is basically suppressed physical activity. He reported that the imagined movement of arm bending created small muscular contractions in the flexor muscles of the arm. In research with downhill skiers, Suinn (1972, 1976) monitored the electrical activity in skiers' leg muscles as they imagined skiing the course. He found that there was muscular activity when they imagined themselves skiing. Muscle activity was highest when skiers were imagining themselves in difficult courses, which would actually require greater

muscle activity. Bird (1984) examined EMG recordings of athletes in various sports and showed significant relationship between the EMG of their imagined sport activity and their actual sport activity.

Some researchers have been critical of the research supporting psychoneuromuscular theory (Hall, 2001). They suggest that many of these studies did not have control group participants. More definitive research appears necessary to empirically verify that imagery actually works as predicted by this theory.

Symbolic Learning Theory

Sackett (1934) suggested that imagery might function as a coding system to help people understand and gain movement patterns. He argued that imagery can help individuals understand their movements. Actions are symbolically coded as a mental map or blueprint (Vealey & Walter, 1993); while imagery strengthens this blueprint, enabling actions to become more recognizable and automatic. According to this theory, skills that are more cognitive in nature (e.g., playing chess) are more easily coded than pure motor skills (e.g., lifting weights).

One way that individuals learn skills is to become familiar with that skill and learn what needs to be done in order to become successful. By making a motor program in the central nervous system, a mental blueprint is formed for successfully completing the movement.

Sackett (1934) demonstrated support for symbolic learning theory on a cognitive task (a finger maze) that could be symbolized. Three groups of 20 subjects each learned a finger maze under the same conditions. Afterwards, each group was given a different set of instructions regarding rehearsal. After seven days, the groups relearned the maze under different circumstances. One group was told to draw the maze pattern as much as they wanted during the interval and subjects in this group were required to make five drawings right after learning and five directly before learning. Another group was told to think through a pattern as much as possible during the week but not to draw or trace the maze. The last group was told not to draw, trace, or think about the maze during the interval.

Verbal reports regarding the activities during the learning, relearning, and rehearsal periods were taken. The results showed that symbolic rehearsal does have a beneficial influence upon retention through drawing and thinking. When the rehearsal was in the form of thinking through the pattern, 80% of the subjects studied the pattern in visual terms and 20% employed the verbal mode.

Hird and colleagues (1991) compared the effects of different ratios of physical to mental practice on the performance of tasks classified as cognitive (pegboard) or motor (pursuit motor). Seventy-two participants were randomly assigned to one of the six conditions that included different amounts of combined mental and physical practice. Their results showed that physical practice was more effective than mental practice in improving pegboard and pursuit motor performance. However, mental practice was effective in improving performance when compared with no practice at all.

This finding supports symbolic-learning theory, which showed that mental practice was relatively effective in enhancing tasks that are cognitive. However, mental practice was effective to a lesser extent in tasks that were predominately motor. This was possible due to the limited number of cognitive components in tasks that were predominately motor, such as weight lifting (Hird et al., 1991).

Symbolic-learning theory may explain how imagery helps in situations where physical practice may be limited due to expense, time constraints, fatigue, or potential for injury (Hird et al., 1991). However, various combinations of physical and mental practice or mental practice alone are not an effective alternative to physical practice. Rather, mental practice can be used as an effective supplement to physical practice (Hird et al.).

Bioinformational Theory

Lang (1977, 1979) proposed bioinformational theory to explain the psychophysiology of imagery, especially in anxiety and phobia disorders. Based on the assumption that an image is a functionally organized set of propositions stored in the brain, the model states that a description of an image contains two main types of statements: stimulus and response propositions.

Stimulus propositions are statements that describe specific stimulus features of the situation to be imagined. For example, a swimmer at a major competition might imagine the crowd, his starting block, locker room conditions, and his teammates. Response propositions are statements that describe the imager's response to the particular situation and are designed to produce physiological activity. For example, response propositions in swimming might involve a swimmer feeling the water with his body, and feeling his heart beating and muscles cramping up as the lactic acid builds up.

The important point in the bioinformational theory is that response propositions are a fundamental part of the image structure in Lang's theory. In this sense, mental imagery is not only a stimulus in the person's head to which he or she responds, but also contains response propositions created for more physiological responses (Bakker, Boschker, & Chung, 1996; Budney, Murphy, & Woolfolk, 1994). From this standpoint, mental imagery scripts are recommended to contain both stimulus and response propositions to create a more vivid image than stimulus propositions alone. Also, it has been argued that the differences between stimulus and response propositions are functionally similar to the differences between

external and internal imagery (Hale, 1994). For instance, Hale (1982) and Harris and Robinson (1986) showed that imagery from an internal perspective produced more EMG activity than from an external perspective.

Although this theory is an improvement over psychoneuromuscular theory and symbolic learning theory, it has little explanation with regard to the motivational functions served by imagery (Hall, 2001). It also does not address the role of imagery in connecting an action with other forms of information processing such as language (Hall, 2001).

Dual Coding Theory

According to Paivio (1986), dual coding theory states that two discrete coding systems are involved in language processing. These coding systems are independent but partly interconnected symbolic systems specialized for encoding, organizing, storing, and retrieving. One system, the image (or imagery) system, is specialized for processing perceptual information with nonverbal objects and events and for making mental images for such events. The other system, the verbal (or linguistic) system, is used for processing linguistic gestures and generating speech.

Annett (1994) proposed a dual coding model that is more detailed to the motor domain. He called the model, action language-imagination (ALI). In his model, there are two main routes in which a person can get information about a skill. These skills are matched up to demonstration and verbal instruction and are based on two independent encoding channels: the motor channel, which is specialized for encoding human actions, and the verbal channel, which encodes linguistic information and speech, including inscriptions. A link is connected between the two channels to describe and generate an action, and to act on verbal commands. This link, according to Annett (1994), is called the action-language bridge and explains how encoding information in both action and languages systems should produce better learning rather than encoding in only one of the systems.

Hall, Moore, Annett, and Rodgers (1997) gave some evidence for this explanation. They investigated the recall of movement patterns presented by demonstration or guided movement without any vision. Participants studied the patterns using one of three strategies - imagery, verbal labeling, imagery and verbal labeling, or no rehearsal strategy (control condition).

Results in this study showed that more patterns were recalled if the participant used a combination of imagery and verbal labeling compared to imagery alone.

Kim, Singer, and Tennant (1998) also showed support for the dual coding theory. Their study compared the relative effectiveness of auditory, visual, and kinesthetic imagery in a golf-putting task. Sixty participants were randomly assigned to one of the five conditions: (1) visual imagery, in which the participants watched a 10 minute videotape that contained golf putting stroke demonstrations without any verbal instructions, (2) auditory imagery, in which the participants listened to an audio taped set of instructions, (3) kinesthetic imagery, in which the participants listened to specific action instructions (e.g., backswing, hit the ball) presented with a tape recorder, (4) irrelevant imagery, in which the group was provided with general imagery information about thinking of all kinds of animals for 10 minutes, and (5) control group, in which the participants were asked to count numbers from 1 to 600.

Results showed that auditory and kinesthetic imagery lead to better retention performance accuracy than with visual, irrelevant, and control conditions. Auditory imagery, which would call for the dual coding of the

information according to the ALI model, led to better retention performance accuracy than to kinesthetic imagery for the performance measures.

Functions of Imagery

Paivio (1985) proposed a framework focused on how imagery can influence physical performance. He suggested that imagery serves two functions: cognitive and motivational, and these functions operate at a specific or general level. A rehearsal of skills or an image of a specific motor skill would be a cognitive function operating in a specific level (cognitive specific imagery; CS). An example of a cognitive skill would be a swimmer imagining about his underwater technique.

A cognitive function operating in a general level (cognitive general imagery; CG) would include using imagery to rehearse entire game plans, strategies of play, and routines. For instance, a quarterback imagining specific strategies throughout a football game would be an example of cognitive general imagery.

The motivational function, at the specific level, involves imagining one's goals and the activities needed to achieve these goals (motivational specific imagery; MS). MS imagery may include a 100-meter hurdler imagining winning the Olympics and receiving the gold medal in front

of millions of people. At the general level (motivational general imagery; MG), images relate to general physiological arousal and affect. A golfer might include a quick relaxation technique by imaging a quiet place between shots to keep calm. Hall, Mack, Paivio, and Hausenblas (1998) recently identified two components of motivational general imagery specific to sport. Motivational general-arousal imagery (MG-A) is related to stress and arousal while motivational general-mastery imagery (MG-M) is related to images of being in control, confident, and mentally tough.

Based upon the above theoretical review, an important empirical question for sport scientists has been to determine the most effective use of imagery to enhance, supplement, or replace physical practice. A vast majority of studies addressing this question have supported the dual functions of imagery in sport settings (Munroe, Giacobbi, Hall, & Weinberg, 2000). The majority of the studies have examined the use of CS imagery (Hall, 2001). Rawlings, Rawlings, Chen, and Yilk (1972) found that imagery practice is as effective as physical practice and reported best to worst order in performance is physical practice, imagery practice, and control conditions.

Considering the results of these studies, it is accepted that CS imagery assists the learning and performance of motor skills (Driskell, Copper, & Moran, 1994; Hall, Schmidt, Durand, & Buckolz, 1994), but not as well as physical practice (Hall, 2001). Durand, Hall, and Haslam (1997) found that a combination of physical and imagery practice is usually no better than 100% physical practice. Also, it is often possible to substitute some CS imagery practice for physical practice without affecting learning and performance. This has important implications for athletes. Although athletes should not substitute imagery practice for physical practice, sometimes there are situations such as travel or injury, where it is only possible to engage in mental rehearsal or mental imagery. In these situations, by using imagery, athletes may be able to maintain their usual levels of practice and perhaps gain some of the positive benefits of physical practice. However, an important future research question to be addressed is whether similar recommendations could be made for individuals within exercise settings.

Hall (2001) questioned the theoretical discussions concerned with the optimum amount of CS imagery practice that should be added to physical practice. He suggested that research on the functional equivalence of imagery and

action might provide some guidance to this issue. The concept of functional equivalence can be simplified in the context of performing motor skills because both types of activity, imagining and performing the activity, are characterized by the need to generate a temporally extended event on the basis of memory (Hall, 2001). From this perspective, imagery can be seen as the process of a "pure" event generation whereas action essentially needs the combination of this generative process to the articulatory system (Vogt, 1995).

Two general approaches have been studied to look at the functional equivalence issue (Hall, 2001). Some researchers have examined the neurophysiological basis of motor imagery. This approach involves examining changes in EEG activity in both motor and sensory areas with the use of imagery. The second approach has compared the effects of imagery practice and physical practice on learning and performance. Ericsson, Krampe, and Tesch-Römer (1993) have shown that CS imagery practice should be treated similarly to physical practice. He also claimed that there is no optimal level of practicing CS imagery. Rather, athletes and exercisers are encouraged to use CS imagery as much as possible when doing a physical activity. CS imagery is viewed as a way to train the mind in conjunction while

physically training the body, and not as a replacement for physical practice. In other words, imagery can be like a vitamin supplement to physical activity, one that could give individuals an edge in improving performance (Vealey & Walter, 1993).

In addition to using imagery to rehearse specific skills (CS imagery), many athletes report using imagery to prepare entire game plans, routines, and strategies of play (Madigan, Frey, & Matlock, 1992). This is called cognitive general (CG) function of imagery. There have not been any controlled studies, but in case reports, athletes have shown the performance benefits of CG imagery for rehearsing slalom canoe races (MacIntyre & Moran, 1996), football plays (Rushall, 1988) and artistic gymnastic routines (White & Hardy, 1998).

When one imagines one's goals, such as winning or positive reinforcement for good performance, one is using motivational-specific (MS) imagery. Bandura (1997) remarks how imagery may influence the self-standards against which performance is appraised and evaluated. When athletes use comparable images with their performances, they have more realistic self-standards and are less likely to give up when they fail. Martin and Hall (1995) suggested that when it comes to enhancing motivation, imagery and goals may go

hand in hand. Also, Munroe, Hall, and Weinberg (1999) found out by interviewing varsity athletes that goal setting is the first effective step in an intervention program, and the next rational step should be for athletes to use these goals as a basis for mental imagery.

In order to develop, maintain, or regain confidence in sport, one should imagine performing in a confident manner (Mortiz, Hall, Martin, & Vadocz, 1996). This is called motivational general mastery (MG-M) imagery. Bandura (1997) argues that confidence is a nondescript term that refers to strength of belief but fails to identify what the assurance is about. In contrast, self-efficacy is the belief of one's capability that one can perform a certain behavior and execute actions required to produce specific accomplishments or goals. Bandura also proposed that positive visualizations enhance self-efficacy by preventing negative visualizations in situations where one may begin to question one's own abilities. Again, the implications for these findings within exercise settings remain to be fully explored, but it seems intuitive that exercisers could benefit from the use of imagery in a variety of ways.

Additionally, we are only beginning to understand the content and function of mental imagery used by regular and non-regular exercisers (Giacobbi et al., 2003; Giacobbi, Hausenblas, & Penfield, 2005).

As MG-M imagery is related to self-confidence and self-efficacy, there is evidence that MG-A imagery is related to arousal and anxiety. Some athletes use MG-A to increase arousal levels (Caudill, Weinberg, & Jackson, 1983; Munroe et al., 2000; White & Hardy, 1998). It has also been shown that competitive anxiety can be influenced by the use of imagery (Gould & Udry, 1994; Orlick, 1990), but this has been difficult to empirically assess.

Overall, research shows that athletes use imagery for both cognitive and motivational reasons. Why they use imagery depends on their goals or what they hope to attain. For instance, imagery use may differ if they want to rehearse a specific skill or a whole game plan, increase self-efficacy, or increase their arousal levels. Since most of the research has been done in the context of sport, a logical next step is to extend this line of inquiry to exercise settings.

Variables Influencing the Use of Imagery

Mental imagery has also been widely used in sport settings. Many athletes report using imagery in both training and competition and even non-elite athletes make considerable use of imagery (Barr & Hall, 1992; Hall, Rodgers, & Barr 1990; Salmon, Hall, & Haslam, 1994).

A number of variables are known to influence how imagery would be effective when used by an athlete or an exerciser which include the specific activity, performer's skill level, gender, and imagery ability (Hall, 2001). Each of these issues will be discussed here. For the purposes of this review, the discussion that follows will only focus on gender issues and imagery ability since these two areas of investigation appear to be most pertinent to the study of imagery.

Gender Differences in the Use of Imagery

Within sport settings there is no evidence that imagery is more effective for one gender than the other in sport and only minor differences have been noted between men and women on their reported use of imagery (Hall, 2001). But, within exercise settings, gender does seem to be a determinant of exercise imagery use. Gammage et al. (2000) reported that women used appearance imagery significantly more than men while men reported the use of technique

imagery more frequently than women. Gammage et al. explained how weight training is competitive in nature and men tend to exercise for more competitive reasons than women. Additionally, females tend to engage in exercise behavior to attain certain cultural ideals with regard to their shape and figure and therefore these motives for exercise may impact how women use exercise imagery.

Imagery Ability

Athletes' ability to use mental imagery, in terms of vividness and controllability, is a distinguishing factor between novice and elite athletes or successful and less successful performers (Hall, 2001). Rodgers et al. (1991) supported this by administering the Movement Imagery Questionnaire (MIQ; Hall & Pongrac, 1983) to figure skaters both before and after a 16-week imagery-training program. This study investigated the effects of an imagery training program (IM) on ability, use, and figure skating performance and compared the influence of IM training to that of verbalization training. Twenty-nine figure skaters were divided into IM and verbal training groups and were assessed for movement IM ability, their use of IM, and free skating performance prior to and following a 16-wk training program. A third group of 11 figure skaters served as controls. Results showed that the IM group was more likely

to use IM before practice sessions, to use IM after practice sessions, to visualize parts of their jumps more easily, and to see themselves winning competitions more often. They could also "feel" (i.e., kinesthetically imagine) themselves skating better than the other groups. The results also suggested that those skaters who became better at visual IM also became more successful at completing their program elements, particularly the more difficult ones.

Goss, Hall, Buckolz, and Fishburne (1986) also administered MIQ to study three kinds of imagery ability groups: low visual/low kinesthetic (LL), high visual/low kinesthetic (HL), and high visual/high kinesthetic (HH). Participants were taught to learn simple movements to a criterion performance level and were then tested on their retention and reacquisition of these movements after a week. The results showed that imagery ability is related to the learning of movements. The LL group took the most trials to learn the movements and the HH group learned the movements in the least number of trials. The same trend was found in the reacquisition stage but the support was weaker for a relationship between imagery ability and retention.

Types of Imagery

Internal Imagery

Internal imagery refers to imagining the execution of a technique or skill from a first-person perspective (Weinberg & Gould, 2003). From this perspective you would only see what you actually execute as if there was a camera on top of your head or as if you were actually performing the skill. For example, if you imagined walking in the woods, you would be able to see the whole environment around you such as the trees, birds, and houses, but you would not be able to imagine anything out of your normal range of vision. The images would also emphasize the feel of movement since it is a first person perspective (Weinberg & Gould, 2003).

External Imagery

External imagery is when you imagine yourself from an external perspective or as if you were watching yourself perform the skill on a movie screen (Weinberg & Gould, 2003). For example, if a basketball player imagined shooting from an external perspective, he would not only see himself shoot, but see all the other players run, jump, block, and be able to see the crowd. But there would be little emphasis on the kinesthetic feel of the movement because the basketball player is simply watching himself

perform it. Overall, many people may switch back and forth between internal and external imagery perspectives (Weinberg & Gould, 2003). The more important issue is whether the individual is able to mentally create clear, controllable images regardless of whether they are from an internal or external perspective.

Exercise Imagery

The potential application of mental imagery in exercise settings has become an emerging topic in exercise psychology research (Gammage, Hall, & Rodgers, 2000; Giacobbi, 2007; Giacobbi, Hausenblas, Fallon, & Hall, 2003; Hall, 1995; Hausenblas, Hall, Rodgers, & Munroe, 1999; Kossert & Munroe-Chandler, 2007; Rodgers, Hall, Blanchard, & Munroe, 2001; Wilson, Rodgers, Hall, & Gammage, 2003). Hall (1995) was the first to propose that exercisers might use mental imagery for motivational reasons similar to athletes. He also proposed that imagery might be a powerful motivator for exercisers through its impact on self-efficacy expectations. In particular, Hall proposed that regular exercisers might imagine themselves engaging in their individual physical activity, enjoying their workouts, and achieving their goals. Such images may then enhance an exerciser's self-efficacy and motivation to exercise.

Hausenblas et al. (1999) were the first to shape the measurement and conceptualization of exercise imagery. In their study, they had semi-structured interviews with aerobic exercisers regarding their use of imagery in exercise. Results showed that exercisers might use imagery for three main reasons: energy, appearance, and technique. From the results, Hausenblas et al. were able to establish a multidimensional measurement called the Exercise Imagery Questionnaire (EIQ). The EIQ showed that exercise imagery was multidimensional, but it did not fully address Paivio's (1985) overall framework. Giacobbi, Hausenblas, and Penfield (2005) highlighted the limitations of the EIQ and developed a measurement that tapped into Paivio's model more fully. They developed a measurement called the Exercise Imagery Inventory (EII) that measured four factors; appearance/health, exercise technique, exercise feelings, and exercise self-efficacy. Although the development of the EII resolved some of the limitations of the EIQ, it still did not fully capture the whole range of functions in exercise imagery (Munroe-Chandler & Gammage, 2005).

Given these concerns, Munroe-Chandler and Gammage (2005) proposed a conceptual framework of exercise imagery that addressed many limitations in research. Not only did

they incorporate the different functions of imagery from Paivio's (1985) framework, they also empirically supported and hypothesized relationships between imagery use and exercise behavior. The proposed model consists of five general components; the antecedents, the five functions of imagery, the outcomes (cognitive and behavioral) of imagery, the efficacy beliefs (as a mediator of the imagery - outcome relationships), and the potential moderating factors. The model suggests that the location of imagery as well as the experience level of the exercisers, goals, and their motivation may influence the type of imagery used. Also, each of the functions of imagery may result in specific outcomes, a relationship mediated by efficacy beliefs. These outcomes in turn can feed back into the efficacy beliefs. Finally, variables such as personality, age, physical health status, imagery ability, and gender might moderate these relationships. Overall, this model highlighted the limitations of current measurement tools in exercise imagery research, the necessity to develop a tool to measure the whole conceptual framework of exercise imagery, and the importance of future research in exercise imagery (Kossert & Munroe-Chandler, 2007).

Although past research revealed that current measurement tools do not cover the whole realm of exercise imagery, most of the current studies heavily rely on these tools (Kossert & Munroe-Chandler, 2007). In a systematic review of exercise imagery by Kossert and Munroe-Chandler (2007), out of 15 studies reviewed, 13 studies either used the EIQ, a modified version of the EIQ, or the EII. Also, out of the 15 studies reviewed, only one study was a qualitative study. This review clearly showed how current research is not measuring the full aspect of exercise imagery and the necessity for more qualitative research to account for how individuals use imagery, the content and function of their images, and to explore new concepts and ideas in exercise imagery.

One qualitative study done in exercise imagery was by Giacobbi et al. (2003). They interviewed 16 undergraduate female regular exercisers to explore and understand the content and function of their exercise related imagery. Using major quotations from the interviews and grounded theory procedures (Strauss & Corbin, 1990), results revealed the following higher order themes: exercise technique, aerobic routines, exercise context, appearance images, competitive outcomes, fitness/health outcomes, emotions/feelings associated with exercise, and exercise

self efficacy. Also, several participants reported that appearance related images served as an important motivation in starting and sustaining exercise behavior. This idea supported the results of the Hausenblas et al. (1999) study and suggested that exercisers' might use imagery as a function of their goals and aspirations such as an improved appearance and fitness benefits. Overall, the Giacobbi et al. study offered future researchers a descriptive and exploratory means of assessing exercisers use of imagery but most of the research done in exercise imagery is still heavily survey-based, and more qualitative studies are needed to allow in-depth investigation and research to create a theoretical and conceptual framework for future investigations.

Another limitation in exercise imagery research that needs to be addressed is that the majority of studies have been conducted with college-aged individuals (Kossert & Munroe-Chandler, 2007). While results from past studies have shown important relationships among motivation, efficacy, and adherence, it is difficult to generalize these results to the overall population, simply because the results are mostly based on a specific age group (Kossert & Munroe-Chandler). In order to represent the general population, it is important to explore different age groups

and find similarities and differences in the content and function of exercise imagery. Recently, Giacobbi (2007) compared the imagery use in exercise by age, gender, and activity level. There were 401 participants between the ages of 18 to 65 ($M = 38.75$, $SD = 13.75$) who completed demographic assessments, a measure of the leisure time exercise questionnaire (Godin & Shephard, 1985), and the EII (Giacobbi et al., 2005). Findings showed that more active people used more appearance and health images than less active people and younger participants reported using more technique images than older participants. Also, the impact of age on imagery use was moderated by activity level, such that younger participants who reported being less active used more technique imagery than older, more active participants. This study overall provided a great starting point that described the imagery-use differences between factors such as age and activity levels. But still, there is much to be investigated with regard to how, why, and under what circumstances middle-aged adults use exercise-related imagery.

Measurement tools used in Exercise Imagery
Exercise Imagery Questionnaire (EIQ)

The EIQ developed by Hausenblas and colleagues (1999) was originally validated on female aerobics participants. The EIQ is a 9-item measure, in which participants rate the frequency of their imagery use on a 9-point scale (1 = never and 9 = always). The measure consists of three subscales, each made up of three items: appearance, technique, and energy. Appearance is a motivational function that focuses on imaging about a fit-looking body. An example of an appearance item is "I imagine a 'fitter-me' from exercising." Energy imagery is also closely associated with one's motivation and it focuses on images related to getting psyched up or feeling energized from exercising. An example of an energy item is "To take my mind off work, I imagine exercising. The last subscale, technique imagery, is more cognitive in nature and focuses on performing skills and techniques correctly with good form. An example of technique imagery will be "When I think about exercising, I imagine my form and body position." Estimates of internal consistency, or Cronbach's alphas, in previous research have indicated reliable results for the EIQ subscales (Hausenblas et al.,

1999: appearance = .84; energy = .90; technique = .86; Rodgers, Hall, Blanchard, & Munroe, 1999; appearance = .87; energy = .88; technique = .90) and the scale demonstrated acceptable factorial validity.

By administering the EIQ to regular aerobics exercisers, results showed that participants used imagery for three primary reasons: to imagine increased energy levels and relief from stress; to imagine appearance related images associated with a leaner, fitter look; and to imagine correct execution of technique while exercising. Analyses also revealed that individuals who exercised regularly used more appearance, energy, and technique imagery.

The EIQ was revolutionary in creating a survey-based assessment of exercise imagery. However, the EIQ was developed and validated with a sample of aerobics participants, making it hard to generalize to other exercise groups (Giacobbi, Hausenblas, & Penfield, 2005; Hall, 1998). Hall (1998) suggested that a more general measure of exercise imagery was needed to allow for the valid and reliable assessment of exercise imagery with individuals who participate in other forms of exercise (e.g., swimmers, weight lifters).

Giacobbi et al. (2003) expressed another concern related to the factor structure of the EIQ as this measure only includes appearance, technique and emotion-related imagery but other dimensions such as health outcomes, exercise context, beliefs and perceptions about completing workouts, and images associated with increased exercise self-efficacy are not measured by the EIQ. Specifically, because self-efficacy has been linked to the initiation (Armstrong, Sallis, Hovell, & Hofstetter, 1993; McAuley, Bane, & Mihalko, 1998), and maintenance (Marcus & Owen, 1992; Marcus, Pinto, Simkin, Audrain, & Taylor, 1994) of exercise behavior and because fitness and health related images elicit important motivational processes within exercise settings (Giacobbi et al., 2003), the Exercise Imagery Inventory was subsequently developed and will now be elaborated upon.

Exercise Imagery Inventory (EII)

The EII was created by Giacobbi and colleagues (2005) and originally consisted of a 41-item measure developed from previous relevant exercise psychology literature (Giacobbi et al., 2003; Hall, 1995; Hausenblas et al., 1999; Rodgers et al., 2001; Rodgers & Gauvin, 1998). The scale was anchored on a 7-point Likert scale with 1 indicating rarely and 7 meaning often and a three-stage

measurement study was implemented with the EII with 1,737 research participants who participated in varying levels of exercise. During phase one the measure was created and administered to 504 undergraduate students. The results of exploratory factor analysis supported a 19-item measure that resulted in four interpretable factors accounting for 65% of the response variance. These were labeled as Appearance/Health Imagery (8 items), Exercise Technique (5 items), Exercise Self-efficacy (3 items), and Exercise Feelings (4 items) and were consistent with our a priori expectations.

In phase two, a separate sample of participants were administered the 19-item version of the EII while four- and five-factors were tested using confirmatory factor analysis. The rationale for testing four- and five-factor models was that the Appearance/Health imagery items appeared to be conceptually different and may in fact correlate differentially with external variables (e.g., exercise behavior). The results of this analysis suggested support for the more parsimonious four-factor model.

Lastly, in phase three the researchers recruited a diverse sample of adults throughout the age span, and administered the EII along with measures of exercise behavior (Leisure Time and Exercise Questionnaire: Godin &

Shephard, 1985) and a measure of exercise self-efficacy (Exercise Self Efficacy: McAuley, 1992). The major purposes of phase three were to replicate phase two and assess correlations with other relevant measures (i.e., exercise self-efficacy and behavior). Overall results supported a four-factor model to explain the underlying structure of the 19-item scale. The four exercise imagery factors were labeled Appearance/Health imagery, Exercise Technique, Exercise Self-Efficacy, and Exercise Feelings. The EII also demonstrated positive correlations with exercise behavior and self-efficacy as individuals who reported engaging in more leisure-time exercise also used more exercise imagery for all subscales, particularly Exercise-Technique.

The Relationship between Self-Efficacy and Exercise Imagery

In conjunction with Bandura's (1986) self-efficacy definition, Bandura (1986) also explained how imagery might be an important tool for creating self-efficacy behaviors. He also proposed that self-efficacy can influence behaviors (e.g., exercise) and cognitions (e.g., anxiety). Hall (1995) was the first to propose that imagery might be a motivating tool for exercisers. Hall (1995) also suggested that imagery predicts self-efficacy behaviors, either through a direct relationship, or through other influential

variables, such as anxiety. Consequently, Hall's (1995) suggestion leads to many direct or indirect routes how imagery might impact physical activity.

In support of Hall's (1995) proposal, Munroe-Chandler and Gammage (2005) proposed a conceptual framework of imagery use in exercise and limitations from previous research. In this model, efficacy expectancy (e.g., imaging oneself perfecting a skill may increase one's confidence in the ability to perform that skill), outcome expectancy (e.g., imaging oneself exercising might help one to lose weight), and outcome value (e.g., imaging the beneficial outcomes of exercise may make one realize the value of one's health) are suggested to mediate the relationship between the functions of imagery and its behavioral cognitive outcomes. This suggestion is consistent with Hall's (1995) proposal in regard to exercise imagery. According to Munroe-Chandler and Gammage (2005), it is possible that imagery may influence efficacy expectancies, outcome expectancies, and outcome values. These efficacy beliefs mediate the relationship between imagery functions and their respective cognitive and behavioral outcomes (Munroe-Chandler & Gammage, 2005). Two studies support this proposal made by Munroe-Chandler and Gammage (2005).

In support of these views, Hausenblas et al. (1999) found that over 75% of aerobic exercise class participants reported using exercise imagery for both motivational and cognitive purposes. They also found that as exercise imagery is increased, so too did the participants' self-efficacy. So by increasing self-efficacy through imagery, it may be possible to indirectly increase motivation to exercise.

According to Hausenblas et al. (1999), the content of exercisers' images are quite varied due to individual differences and their responses were organized into nine categories: body image, techniques/strategies, feel good about oneself, motivation, general exercise, fitness/health, music, goals, and maintaining focus. These contents reveal the reasons why exercisers are using imagery (e.g., body image corresponds with the appearance function of exercise imagery).

A similar descriptive study regarding exercise imagery was conducted by Giacobbi et al. (2003). In this study, 16 female regular exercisers were interviewed to understand the content and function of their exercise related imagery. Using major quotations from the interviews and grounded theory procedures (Strauss & Corbin, 1990), the results revealed the following higher order themes: exercise

technique, aerobic routines, exercise context, appearance images, competitive outcomes, fitness/health outcomes, emotions/feelings associated with exercise, and exercise self efficacy. Several participants said that appearance related images served as an important motivation in starting and sustaining exercise behavior. This idea supported the results of Hausenblas et al. (1999) and again suggested that exercisers might use imagery as a function of their goals and aspirations, such as an improved appearance and fitness benefits. Also, appearance related images might have important motivational functions for exercisers. Overall, this study offered future researchers a descriptive and exploratory means of assessing exercisers' use of imagery (Giacobbi et al., 2003).

One study, done by Wesch, Milne, Burke, and Hall (2006), investigated the relationship between self-efficacy and imagery use in older adult exercisers. Ninety-two (n = 40 male, n = 52 female) active older exercisers were recruited in various exercises classes that included weight training, walking, or a combination of cardiovascular and resistance training activities. Self-efficacy was measured using the Self-Efficacy Questionnaire for Exercisers (SEQE; Rodgers & Sullivan) and their imagery use was evaluated using the EIQ (Gammage et al., 2000; Hausenblas et al.,

1999). Results revealed that older exercisers demonstrated three different types of self-efficacy: task, barrier, and scheduling. Out of the three, participants were most efficacious in terms of the task, followed by scheduling physical activity into their daily routines, and finally overcoming barriers related to physical activity. In regards to imagery use, participants reported using appearance and technique imagery much to the same extent, but used both significantly more than energy imagery. In the relationship between self-efficacy and imagery, technique and appearance imagery did not predict task self-efficacy, whereas energy imagery was a significant predictor. None of the three functions of imagery predicted barrier and scheduling self-efficacy. Overall, the results of this study revealed that older adults are efficacious in terms of task, scheduling, and overcoming barriers. Also, older exercisers appear to use three types of imagery (e.g., technique, appearance, and energy), and the use of energy imagery significantly predicts task self-efficacy. One suggestion from the authors was to find a better understanding of self-efficacy and imagery that could possibly assist practitioners in their attempts to encourage older adults to become more physically active.

Another study, done by Rogers, Hall, Blanchard, and Munroe (2001), studied if imagery, coping efficacy, and scheduling directly predicted exercise behaviors. They found that coping efficacy and scheduling did impact exercise behaviors and efficacy and appearance imagery predicted behavioral intention. These findings suggested that self-efficacy may somewhat mediate exercise cognitions.

Gammage, Hall, and Rogers (2000) found that presentational efficacy expectancy, self-presentational outcome expectancy, and appearance imagery all accounted for significant variance in social physique anxiety. These findings suggested that various manifestations of self-efficacy may somewhat mediate the relationship between imagery and its outcomes.

With regards to Bandura's (1986), Hall's (1995), and Munroe-Chandler and Gammage's (2005) suggestions, it is important to note that imagery might be a valuable and functional starting tool to lower fear of falling rates and increase exercise rates.

Imagery Use in Middle-Aged and Older Adult Exercisers

Despite the numerous beneficial outcomes of imagery use to exercisers, the majority of studies in exercise imagery research have been conducted with college-aged individuals (Kossert & Munroe-Chandler, 2007). Milne, Burke,

Hall, Nederhof, and Gammage (2006) compared exercise imagery use in younger and older adult exercisers. They found that younger and older adult exercisers showed the same pattern of imagery use, with appearance imagery being used most frequently, followed by technique and energy imagery. However, the younger group used more appearance imagery than older exercisers and younger female exercisers used less technique imagery than older female exercisers. The reason why younger adults tend to use appearance imagery more is that appearance seems to be an important motivator for older adults, but older people tend to be more satisfied with their appearance than younger individuals (Hetherington & Burnett, 1994; Pliner, Chaiken, & Flett, 1990). Therefore, older exercisers would use less appearance imagery than younger exercisers.

Recently, Giacobbi (2007) compared the imagery use in exercise by age, gender, and activity level. There were 401 participants between the ages of 18 to 65 ($M = 38.75$, $SD = 13.75$) who completed demographic assessments, the Leisure-Time Exercise Questionnaire (LTEQ: Godin & Shephard, 1985), and the EII (Giacobbi et al., 2005). Findings revealed that more active people used appearance and health images more than less active people. Also, younger participants reported using more technique images than

older participants. The impact of age on imagery use was moderated by activity level, such that younger participants who reported being less active used more technique imagery than older, more active participants. Overall, this study described imagery-use differences between certain factors such as age and activity levels. But there is still much to investigate why, and under what circumstances middle-aged adults use exercise-related imagery.

With current limitations in exercise imagery research, Kim and Giacobbi (2009) expanded pre-existing research by focusing on the overall use of exercise imagery with middle-aged adults. Specifically, by using qualitative methods, 30 middle-aged adults aged from 35 to 65 years old ($M = 48.13$, $SD = 8.33$, $n = 11$ males, $n = 19$ females) were interviewed to examine when, where, what (content), and why (function) they used imagery focused on their exercise behaviors. By using grounded theory procedures, results revealed seven higher order themes: exercise technique, appearance images, health outcomes, plans/strategies, stress levels/emotions, confidence enhancing images, and energy/drive images. Age and gender differences were also observed. Sixty-three percent of all male participants ($n = 7$) used technique imagery the most, while 47% ($n = 9$) of female participants used appearance images the most. In

addition, 73% ($n = 8$) of the respondents in the 35 to 45 year old group reported using technique imagery the most, while 47% ($n = 9$) of 46 to 65 year olds used appearance imagery the most. Also, 42% ($n = 8$) of 46 to 65 year olds reported imagery focused on health outcomes the most, while none of the 35 to 45 year old participants reported health related imagery as their top priority.

With regard to the content of the participants' images, the results showed the content and function of exercise imagery to be consistent with previous research (Giacobbi, 2007; Giacobbi et al., 2003; Hausenblas et al., 1999). Specifically, the major themes of the participants' images (e.g., what they imaged) were coded as technique imagery, appearance, images, health outcomes, plans/strategies, emotions/stress levels, confidence-enhancing images, and energy/drive images. Similarly, Giacobbi et al. found the content of female aerobics participants' images consisted of exercise technique, aerobic routines, exercise context, appearance images, competitive outcomes, fitness/health outcomes, emotions/feelings, and exercise self-efficacy. In addition to these consistencies, appearance-related images served as important motivators to sustaining exercise behavior, especially for female participants in this study and

previous research (Gammage et al., 2000; Giacobbi et al.; Hausenblas et al.). This finding was reasonable, as most of the participants were female in previous investigations and the pressure placed on women to maintain a physically ideal body weight and appearance are crucial (McAuley & Burman, 1993; Silberstein, Streigel-Moore, Timko, & Rodin, 1988). While this study showed consistency with previous research, there was clearly a difference within the theme of appearance. In the theme of appearance imagery of Giacobbi et al.'s study, the younger participants imaged about their current image, such as toning the body or losing weight. In Kim and Giacobbi's (2009) study, most of the participants imaged about their past and compared it to their present. These comparisons revealed that even though participants imaged about the same theme (e.g., appearance), the actual content was different.

With regards to male participants, there was also consistency with previous work. Most of the male participants in Kim and Giacobbi's (2009) study reported using technique related images. Also, when comparing age groups, the younger group (35 to 45 years old) imaged about technique imagery the most. This result was consistent with Giacobbi's (2007) study that younger males tend to image about their technique more than older males ages 45

to 65. Others have suggested that differential images between males and females are due to motivational aspects of exercise as men tend to exercise more for competitive reasons, both against themselves and others as compared to women (Biddle & Bailey, 1985; Markland & Hardy, 1993; Mathes & Battista, 1985).

While the findings from Kim and Giacobbi's (2009) study confirmed previous research, two important extensions deserve attention. First was the value of health related images of the participants in this study. The vivid descriptions provided the potential for health improvement in exercise and how exercise imagery focused on health outcomes impacted participants' motivation were astonishing. In particular, most of the participants in this study imaged about their younger, healthier years, and prevention of illnesses and diseases motivated them to exercise. From the results, it appears that health related images are an important source of motivation for middle-aged and older adult exercisers and should be incorporated into future intervention studies.

While health related images were reported by Giacobbi et al.'s (2003) participants, there was a stark contrast in the number of participants who discussed these images and in the level of specificity reported in this study. For

instance, 83% of the participants reported health related images while only 31% reported such images in Giacobbi et al. It was also interesting to see that 42% of the participants in the older group (46 to 65 years old) imaged about health images the most, while no one in the younger group (35 to 45 years old) imaged about health images the most. From these results, one may interpret that as one gets older, one will use more health related images.

According to the Centers for Disease Control and Prevention (2003), recommended physical activity declines from 56.9% in the age group of 18 to 24 to 42.8% percent in the age group of 45 to 65. There is also a significant increase of insufficient physical activity, inactivity, and no leisure-time physical activity as age increases. This increase of inactivity as one ages will lead to more susceptibility to diseases, injuries, and other medical problems. Due to these factors related to age, it may seem obvious for individuals to image about their health (e.g., prevention of diseases, treatment for injuries) when engaging in exercise. To an extent, the results of this study support this notion.

A second important issue in this study was the findings of plans, routines, and strategies (cognitive general; CG) used by exercisers. Previous research has

shown that many athletes strategize or rehearse entire game plans and use those strategies to excel in their respective sport (Munroe et al., 2000). The results of the current study revealed more than half (63%) of the participants reported the use of some kind of plan or routine with regard to their exercise imagery. For instance, planning out a workout before exercise, imagining someone competing next to me, doing checklists in one's head while exercising, and setting up goals during a workout program were all poignant points made by participants citing that these aspects were important motivators.

As highlighted from Munroe-Chandler and Gammage (2005), using cognitive general imagery is also one of the imagery functions that lead to efficacy beliefs, behavioral, and cognitive outcomes. From the theoretical frameworks of Paivio (1985), Munroe-Chandler and Gammage, the results from the current study, and previous qualitative work in exercise imagery by Giacobbi et al. (2003), CG is an important component in exercise imagery. However, none of the current measures of exercise imagery have subscales related to routines or strategies (Giacobbi et al., 2005; Hausenblas et al., 1999), and a more comprehensive inventory is needed to measure all the functions of exercise imagery (Kossert & Munroe-Chandler,

2007). Overall, this study represented a descriptive basis for research in exercise imagery by using grounded theory analysis and the development of a conceptual framework. The authors suggested future research focus on the content (e.g., the what) of exercise imagery. Although this study revealed strong relations with the content and function of exercise imagery, the authors request more research to clarify and distinguish the relationship between the content and function of exercise imagery. Since research suggests that exercise imagery is related to self-efficacy (Giacobbi, 2007; Giacobbi et al., 2003, 2005; Hall, 1995; Hausenblas et al., 1999), the authors say that the focus should now turn to see if exercise imagery could directly or indirectly impact exercise behavior in middle-aged and older adults.

Mind-Body Therapies

The National Center for Complementary and Alternative Medicine (2006) defined mind-body therapy as the interactions among the brain, mind, body, and behavior and the powerful ways in which emotional, mental, social, spiritual, and behavioral factors can directly affect health. It is an approach that respects and enhances each person's capacity for self-knowledge and self-care, and it emphasizes techniques that are grounded in this approach.

There are several mind-body therapies that inter-relate with one another. In this section, five mind-body therapies will be briefly reviewed: progressive muscle relaxation (PMR), hypnosis, tai-chi, yoga, and guided imagery. These therapies were chosen because, according to Morone and Greco (2007), these five therapies have been commonly used and widely accepted, and are studied in clinical trials. For the purpose of this dissertation, more emphasis will be placed on guided imagery.

Progressive Muscle Relaxation (PMR)

PMR is a systematic relaxation method developed by Jacobsen (1974). In PMR, participants tense and relax various muscle groups, from one end of the body to the other. With practice over time, enhanced awareness of the body and increased ability to relax quickly can be gained (Morone & Greco, 2007). Usually, participants are taught and then recommended to use a recording for home practice. Over time, fewer and fewer muscle groups are tensed and relaxed and, eventually, the person can relax the body at will without tensing. PMR is usually combined with other mind-body techniques such as guided imagery to get the full effect (Morone & Greco).

Hypnosis

According to the American Society of Clinical Hypnosis, hypnosis is defined as "a state of inner absorption, concentration and focused attention." A hypnosis session usually has several components and is typically lead by a trained therapist. It includes induction of the hypnotic state by the therapist, who then gives suggestions and guides the person out of the hypnotic state (Stewart, 2005). Sessions are typically individual, but can be in a group (Morone & Greco, 2007). Participants can also be taught self-hypnosis and be provided with audio or visual equipment for home practice.

Tai chi

Tai chi is a practice that has been used for thousands of years in China and has become a popular and effective lifestyle health practice in the West. Tai chi are forms of low-impact exercise and stress management training. It involves slow controlled motions and focused breathing, and are thought to enhance the body's energy or 'qi/chi' (Morone & Greco, 2007). Tai chi "forms" typically include a series of gentle fluid movements, mental concentration, and controlled breathing.

Yoga

There are many types of yoga that started in India about 2000 years ago, and the most popular yoga in American culture is the Hatha (Morone & Greco, 2007). It usually involves holding the body in a sequence of postures for a certain period of time, breathing exercises, and meditation. Typically, postures are done sequentially with the aim of increasing flexibility and strength. The breathing and meditation exercises are done to calm and focus the mind to develop greater awareness (Riley, 2004). There are many therapeutic benefits of yoga and it has been studied as an intervention in many medical conditions such as anxiety, musculoskeletal, and cardiopulmonary function (Kirkwood, Rampes, Tuffrey, Richardson, & Pilkington, 2005; Raub, 2002).

Guided Imagery (GI)

GI is defined by Tusek, Church, and Fazio (1997, p. 664) as "a therapeutic technique that is used to ease patients' anxiety levels and promote relaxation." Naparstek (1994, p. 22) describes it as "a process of deliberately using the imagination to help the mind and body heal, stay well, or perform well." It is a directed and purposeful creation of using all senses such as sight, sound, smell, taste, and feel. It is a series of verbal

suggestions to create a flow of thoughts that focus the individual's attention on imagined poly-sensations (Baird & Sands, 2006). The process of refocusing the individual's attention on these imaged sensations results in specific psychological and physiological responses (Lang, 1979). GI with relaxation is a cognitive behavioral technique that is easy to teach and use (Baird & Sands, 2006). As explained in chapter 1, guided relaxation is a vital addition to GI, as it helps to allow total concentration on the sensory sensations. Recently, relaxation has been a common attachment to GI, so many articles refer to the intervention as GI when, in fact, both GI and relaxation are used (Klaus et al., 2000; Moore & Spiegel, 2000).

GI sessions can occur in the presence of a trained individual in guided imagery, or with audio tapes, CDs, scripts and, more recently, online videos (Morone & Greco, 2007). Usually, a GI session begins with a relaxation exercise to relieve tension and focus attention before the actual GI. The relaxation exercise may differ between individuals but usually it involves a breathing exercise or visualizing a "safe" place (Morone & Greco). The session then moves to more specific guided images. Van Kuiken (2004) did a meta-analysis in GI research and overall found four types of imagery that were used in modern

interventions. The first involves pleasant imagery - such as imagery of a pleasing location. A second image involves a physiological focused imagery - for example, imagery of blood flowing through the whole body. A third image involves mental rehearsal - for example, imagining about walking through a park without feeling any pain. The last kind of imagery that Van Kuiken found was an imagery called receptive imagery. This imagery involves scanning the body for diagnostic or reflective purposes such as a breast cancer patient imaging about removing the cancerous pathogens from her body. All these images may have a mental reframing, which means imagery that reinterprets a past experience and its associated emotions.

GI is usually based on the biopsychosocial theory of chronic pain (Engel, 1977) and the psychoneuromuscular theory (Jacobson, 1932). According to the biopsychosocial theory (Engel), many factors affect the sensation, transmission, and perception of pain. GI might initiate cognitive processes such as coping, refocusing attention, and distraction (Schoenfeld-Smith et al., 1996). According to the psychoneuromuscular theory (Jacobson), GI may stimulate mental rehearsal of desired movements, therefore increasing motion with fewer mobility-related symptoms (Pfurtscheller, Neuper, Ramoser, & Muller-Gerking, 1999).

In research, GI has been proven to be an effective therapeutic tool. Some successful GI interventions in research are helping with smoking cessation (Wynd, 2005), improving the quality of life in cancer patients (Luebbert et al., 2001), reducing stress and anxiety for patients undergoing chemotherapy (Walker et al., 1999), and reducing fear in dental treatment (Willumsen et al., 2001), fear of flying (Wiederhold et al., 2002), and fear of snakes (Hunt et al., 2006). Although there has been numerous research done with GI, not much research has been done with GI in the older population (Morone & Greco, 2007).

Baird and Sands (2006) did a study on the effectiveness of GI and progressive muscle relaxation (PMR) in reducing chronic pain with adults who have osteoarthritis. Twenty-eight women with osteoarthritis over the age of 65 were randomized into 12-weeks of a control group ($n = 10$) or a group who was given GI with PMR ($n = 18$). Participants in the intervention group were told to do two 10 to 15 minute GI sessions with PMR twice a day. Results showed 88.8% of the reported GI usage at least once a day and found significant differences in pain and mobility. Overall, this study demonstrated the feasibility of GI as an intervention in older adults by suggesting benefits in pain reduction and increased mobility.

Summary

From the literature review, fear of falling can have a detrimental effect on older adults. Due to this fear, it will be likely that older adults will not get out of their bed or chair simply because they are afraid that they might fall. If individuals are afraid to get out of their bed or chair, many other physical and psychological problems will arise, such as loss of confidence, depression, and a weakened body. The probability of an individual falling will also increase considerably due to this inactivity.

A simple, cost effective method is needed for these individuals to eliminate their FOF, build up their confidence, and start an exercise program to make them stronger and decrease the likelihood of falling. According to a Fall Prevention Program created by Newton (1997), physical activity is one of the best ways to reduce falling. Also, physical activity is one key to an individual's well being and sense of confidence. Activity level is based on the individual's preference and includes social, mental, and physical benefits. A great method to start an exercise program is to teach individuals how to use relaxation and imagery. As explained in the literature review, using imagery has many beneficial effects such as increasing confidence,

motivation and, most importantly, creating efficacy to exercise. It is very simple to use and, once taught, individuals can use imagery any time, anywhere. Hopefully, by teaching individuals who have a fear of falling how to use imagery, it will be a good starting point for them to start losing their fear and increase their physical activity.

CHAPTER 3

METHODOLOGY

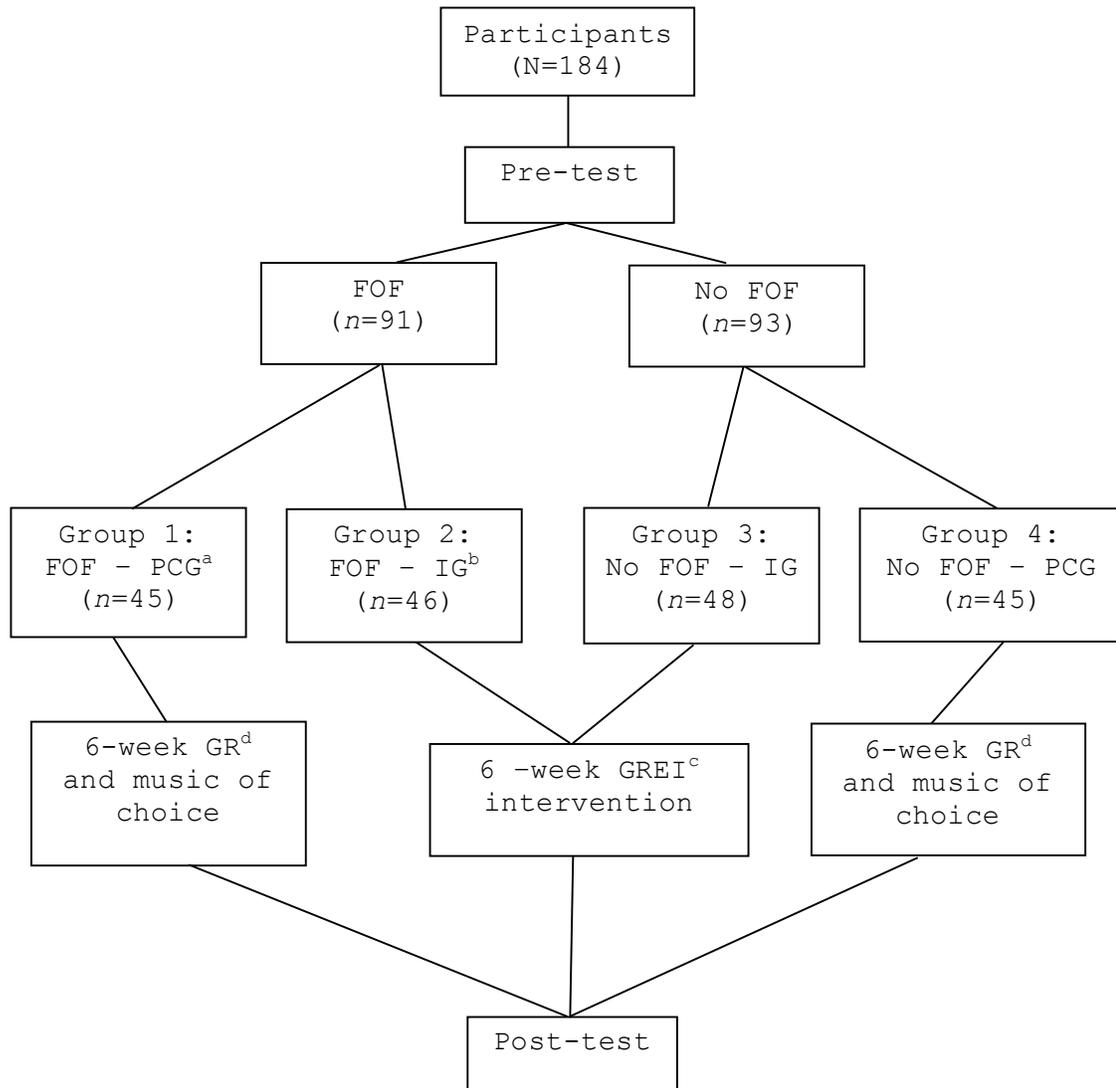
The main purpose of this study was to examine the effects of a six-week intervention that used Guided Relaxation and Exercise Imagery (GREI) techniques on lowering Fear of Falling (FOF) rates among community dwelling adults aged 60 and above. A secondary purpose was to study the effect of GREI techniques on self-efficacy, self-confidence, exercise imagery use, perceived exercise levels, and specific simple mobility tests. This chapter is presented in the following sections: (a) research design, (b) participants, (c) instrumentation, (d) control and intervention groups, (e) procedures, (f) pilot study, and (g) data analysis.

Research Design

The following four groups were created in this study: Group (1) fear of falling placebo control group (FOF - PCG), Group (2) fear of falling intervention group (FOF - IG), Group (3) no fear of falling intervention group (No FOF - IG), and Group (4) no fear of falling placebo control group (No FOF - PCG).

The research design was a true experimental design with repeated measures. For an overall view of the design, please refer to Figure 1.

Figure 1. Overall Research Design



^aPlacebo Control Group, ^bIntervention Group, ^cGuided Relaxation and Exercise Imagery, ^dGuided Relaxation

Participants met with the researcher two times to conduct pretests and posttests. During the pretest, the participants completed an informed consent form (Appendix A) and a demographics/screening form that included the question, "do you have a fear of falling?" (Appendix B). Participants then filled out the following questionnaires: (a) Exercise Imagery Inventory (EII; Giacobbi et al., 2005; Appendix C) which measures exercise imagery use, (b) Activities-specific Balance and Confidence (ABC) Scale (Powell & Myers, 1995; Appendix D) which measures confidence levels performing various activities without falling, (c) Short Falls Efficacy Scale-International (Short FES-I; Kempen et al., 2008; Appendix E) which measures efficacy levels related to falls, and the (d) Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985; Appendix F) which measures perceived amount and intensity of exercise a participant does in a week. After the four questionnaires, the following mobility tests were administered: the (a) Timed Up and Go (TUG; Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000) and the (b) One Leg Stance (OLS; Berg et al., 1989). All of the questionnaires and mobility tests are explained with more detail in the 'Instrumentation' section.

After the mobility tests, participants were placed in one of the two groups by the researcher (FOF or No FOF). The subjects were then randomly placed into the subgroups (control or intervention). The 1 Question Fear of Falling (1QFOF) was asked in the demographics/screening form to find out if the participant did or did not have a fear of falling. If a participant had a fear of falling, he/she was randomly placed in either group one or two (see figure 1 for group descriptions). If a participant did not have a fear of falling, he/she was randomly placed in either group three or four.

Experimental treatments were administered in the form of a GREI audio CD created by the researcher or a placebo audio CD that included two relaxation tracks. If participants were placed in group one and four, they were the Placebo Control Group (PCG). In the PCG, participants were given a placebo audio CD that consisted of one introductory track and two guided relaxation tracks. They were also instructed to listen to music of their choice for five minutes after listening to a relaxation track. Participants listened to a relaxation track and songs of their choice for six weeks, two times a week (day of their choice but had to be consistent days throughout the six weeks), and for 10 minutes a session (time of their choice

but had to be consistent times throughout the six weeks). They were also given an instruction booklet (Appendix G) and a checklist (Appendix H) to monitor their progress during the six weeks.

Participants in groups two and three were the intervention groups. For these groups, the same procedures were used as in the placebo control groups but, instead of a placebo audio CD, participants were given a GREI CD created by the researcher. This CD consisted of one introduction track, two guided relaxation tracks, and 12 guided imagery tracks. More explanation is given below in the 'Control and Intervention Groups' section. After six weeks, the researcher met with all of the participants and administered the same instruments that were given in the pretest.

Participants

A total of 184 participants were recruited from various churches, senior homes, and centers in an urban city. Participants were female and male elderly adults aged 60 and older with varying ethnic backgrounds and economic status. There were two groups of 45 (Groups 1 and 4), one group of 46 (Group 2), and one group of 48 (Group 3) participants. Each participant was put in a group as explained in the 'Research Design' section. Because all

the participants were over the age of 60, the general state of physical and mental health was asked during the demographic/screening form stage before asking for their participation.

The inclusion health criteria were: (a) able to walk without aids (occasional cane users will be included), (b) no history of any disabilities or illnesses listed on the demographics/screening form, (c) participant able to understand the information in the informed consent form and willing and able to sign the consent.

If a participant answered 'yes' to any of the following criteria while filling out the demographics/screening form, he/she was excluded from the study: (a) a history of Parkinson's disease that restricts them from doing activities, (b) a history of a stroke or any heart diseases that is not treated and restricts them from doing activities, (c) severe rheumatoid arthritis or osteoarthritis that would cause discomfort during walking or stair climbing, (d) a history of fracture due to fall, (e) diagnosis of untreated diabetes, (f) untreated uncontrolled heart (Hypertension: BP \geq 140/90), or lung disease (uncontrolled asthma or shortness of breath), (g) a history of Alzheimer's disease that is not treated, and (h) not willing or able to follow procedures specified by the

study and/or instructions of the researcher.

A sample size of at least 180 was decided by a statistical power analysis using a multivariate method (Tabachnick & Fidell, 2006) with a medium effect size of $f = .25$. This sample size was also recommended by a professor in statistics (Personal communication with Joe Glutting, PhD, August 8, 2008).

Instrumentation

During the pretest, a demographics/screening form was administered before giving out the instruments. The demographics/screening form consisted of questions related to participants' health and ability to complete the study (e.g., history of any illnesses, disabilities).

The following instruments were given pretest and posttest: (a) EII (Giacobbi et al., 2005), (b) ABC scale (Powell & Myers, 1995), (c) Short FES-I (Kempen et al., 2008), and the (d) LTEQ (Godin & Shephard, 1985). Along with the questionnaires, the following mobility tests were administered: (a) TUG (Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000) and (b) the OLS (Berg et al., 1989). Each of the instruments are explained below.

Exercise Imagery Inventory (EII)

The EII is a 19-item scale developed through a construct validation approach by Giacobbi et al. (2005). It consists of the following four subscales: Exercise Technique, Exercise Self-efficacy, Exercise Feelings, and Appearance/Health images. Evidence for the validity of the EII has been demonstrated through exploratory and confirmatory factor analysis with separate samples of college students and adults throughout the age span. Additionally, assessments with the EII subscales, exercise behavior, and exercise self-efficacy have yielded positive and significant associations that ranged between .10 and .46. The scale is anchored on a 7-point Likert scale with 1 indicating rarely and 7 meaning often.

Activities-specific and Balance Confidence (ABC) Scale

The ABC scale was created by Powell and Myers (1995) from the limitations of the FES. The ABC scale included a wider continuum of activity difficulty and more detailed item descriptors than the FES. Both the FES and ABC scales were found to be internally consistent and demonstrated good test-retest reliability, convergent and criterion validity (Powell & Myers, 1995).

While both scales were able to discriminate between the two mobility groups, the ABC scale was more efficient at discriminating and yielding a wider range of responses than the FES. In the scale, participants are asked to rate their levels of confidence on a scale between 0% and 100% when performing a variety of activities, such as climbing stairs, reaching above the head, and walking on different surfaces. Responses are summed and then divided by 16 to provide an overall mean balance confidence score. Healthy older people have been reported to score 90 - 100% on the ABC scale.

Short Falls Efficacy Scale - International Version (Short FES-I)

In 2008, Kempen and colleagues created a shortened version of the FES-I (Yardley et al., 2005) called the Short FES-I, arguing that the FES-I (Yardley et al.) might be too long and researchers might be interested in a briefer instrument, especially when it is used as part of many other scales for screening purposes. Also, the high internal consistency of the FES-I suggested the redundancy of the questions. The Short FES-I includes seven items out of the original 16. The seven items were chosen from a combination of face validity and psychometric criteria. The first criterion was that all items must be able to

discriminate between participants reporting no falls, one fall, or more than one fall within the past year (Kempen et al., 2008). Items like 'cleaning the house' and 'preparing simple meals' were excluded because they did not significantly discriminate between people with no falls or one fall (Yardley et al.). The second criterion was to assess the full range of levels of fear, and that the Short FES-I must include a balanced range of items that assessed low, medium, and high levels of fear in some people (Kempen et al., 2008).

After the items were chosen, an internal reliability check was done showing a Cronbach's alpha of 0.92. After creating the Short FES-I, Kempen and colleagues compared their version to the original FES-I. Results showed a Spearman correlation of 0.97 between the FES-I and the Short FES-I. Also, results showed that the shorter version of the FES-I was highly comparable with the 16 item FES-I with respect to internal validity, test-retest reliability, and discriminative power.

In contrast to the FES, both the FES-I and the Short FES-I include physically more demanding activities outside the home such as "going out to a social event." Overall, Kempen and colleagues concluded that the Short FES-I is a good alternative in settings when less time for assessment is available or participants are less able to fill out long questionnaires.

Leisure Time Exercise Questionnaire (LTEQ)

The LTEQ is a three-item scale created by Godin and Shephard (1985) that asks respondents to rate how often they engage in mild (i.e., minimal effort), moderate (i.e., not exhausting, light sweating), and strenuous (i.e., heart beats rapidly) leisure-time exercise during a typical week. The LTEQ allows researchers to calculate a total Metabolic Equivalent score (MET) score by weighting the intensity level and summing for a total score using the following formula: +3(mild), +5(moderate), and +9(strenuous). The LTEQ is a reliable ($r = .86$) and valid self-report measure of exercise behavior in adults (Godin, Jobin, & Bouillon, 1986; Jacobs, Ainsworth, Hartman, & Leon, 1993).

Timed Up and Go (TUG)

The TUG, derived from the original up and go test, is an indicator of 'basic mobility,' and measures the time required for a participant to rise from a chair, walk three

meters, return to the chair and sit down (Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000). The time taken to complete the task is strongly correlated with level of functional mobility. For example, the more time taken, the more dependent in general activities of daily living. When first created, the cutoff level to predict high risk fallers was 30 seconds (to complete the whole task), but recently, through validity measures, adults who take more than 14 seconds are at risk of falling (Shumway-Cook et al.). Specifically, the cutoff level for TUG is 15 seconds or longer with an overall correct prediction rate of 90% (Shumway-Cook et al.). Usually, normal healthy older adults complete the task in 10 seconds or less and very frail or weak older adults with poor mobility may take two minutes or more (Shumway-Cook et al.).

Participants begin the test in a chair with their backs resting on the back of the chair. The chair should be in a stable position such that it will not move when the participants move from sitting to standing. The researcher placed a marker or tape on the floor three meters away from the chair so it can be easily seen by the participants. On verbal instruction from the researcher, participants were asked to rise from the chair, walk forward three meters at their usual walking pace, turn 180 degrees, walk back to

the chair, turn 180 degrees, and sit down. The time begins when their buttocks are released from the chair and stops when their buttocks contact with the chair as they are sitting down. Participants may use any gait aid that they normally use when they walk, but may not be assisted by another person. There is no time limit. Participants may practice before the actual testing.

One Leg Stance (OLS)

The OLS is a frequently used clinical tool for assessment of balance with people who have various balance disorders (Berg et al., 1989; Bohannon & Leary, 1995; Tinetti, 1986). From the initial cue by the researcher, participants will stand on their preferred leg with hands on their hips and eyes open, looking straight ahead. The researcher will begin timing the trial with a handheld stopwatch when the participant's foot leaves the ground. The trial time is stopped when (1) the participant's foot touches the ground or the stance leg, (2) the participant's arms swing away from their hips, or (3) the participant reached a maximum time of 30 seconds. The participants practiced for as long as they wanted to before the actual testing.

The ability to stand on one leg is used alone or as an item in clinical balance tests assessing postural steadiness in the elderly (Berg et al., 1989; Bohannon & Leary, 1995; Tinetti, 1986). Clinical tests of the OLS identify postural steadiness by the number of seconds a person can maintain the OLS position, meaning that better postural steadiness would allow for longer standing on one leg. However, established balance scales require different OLS times for maximal scores (Berg et al.; Bohannon & Leary; Tinetti). For the highest score on the Berg Balance Scale (Berg et al.), participants are supposed to stand unsupported for at least 10 seconds on one leg. In Bohannon's Ordinal Balance Scale (Bohannon & Leary), 30 seconds are required, and in Tinetti's Balance Subscale (Tinetti) participants have an alleged normal balance if they are able to stand on one leg without support for five seconds.

Jonsson, Seiger, and Hirschfeld (2004) investigated measuring a certain time window of standing on one leg. They examined postural steadiness for 30 seconds of the OLS in healthy young and elderly adults. Results showed that standing on one-leg was characterized by a decrease of force variability during the first five seconds (dynamic phase) and maintenance of constant force variability level

during the remaining standing time (static phase). These results indicate that the difficulties in maintaining the static position are dependent on both an impairment to balance for the postural troubles caused by the weight shift and on musculoskeletal disadvantages, suggesting that the first five seconds are crucial for OLS.

Placebo Control and Intervention Groups

In this study, two groups were the placebo control (groups one and four) and two groups were the intervention (groups two and three). Participants who had an FOF were randomly assigned to groups one or two. Participants who did not have an FOF were randomly assigned to groups three or four. Each group is explained in more detail below.

Group 1: Fear of Falling - Placebo Control Group (FOF - PCG)

In this group, participants answered 'yes' to the question 'do you have a fear of falling?' In the PCG, the participants were given a placebo audio CD that consisted of one introductory track and two guided relaxation tracks (same relaxation tracks given in the intervention group). They were also instructed to listen to music of their choice for five minutes after listening to a relaxation track. Participants listened to the relaxation track and songs of their choice for six weeks, two times a week (day

of their choice but had to be consistent days throughout the six weeks), and for 10 minutes a session (time of their choice but had to be consistent times throughout the six weeks). After listening to one of the two relaxation tracks, they listened to different music during each of the 12 days. Participants were also given an instruction booklet and a checklist so they could monitor their progress during the six weeks.

Group 2: Fear of Falling - Intervention Group (FOF - IG)

In this group, participants answered 'yes' to the question 'do you have a fear of falling?' Participants in this group were given an audio GREI CD created by the author. The CD consisted of one introduction track, one exercise imagery vividness/controllability exercise track, two guided relaxation tracks (e.g., progressive muscle relaxation and deep breathing), and 11 guided imagery tracks (Table 1).

The introduction track explained the overall directions on how to use the CD (see Appendix I for introduction draft). Track two consisted of an imagery controllability and vividness exercise to get the participant familiar with imagery (see Appendix J for draft). Tracks three and four consisted of two well known relaxation techniques.

Table 1. GREI CD Track List

Track	Title (min:sec)
1	Introduction to the GREI CD
2	Imagery Exercise (how to control and make your images vivid)
3	Guided Relaxation 1 - Progressive Muscle Relaxation (PMR)
4	Guided Relaxation 2 - Deep breathing
5	Guided Imagery 1 - In home (morning)
6	Guided Imagery 2 - In home (evening)
7	Guided Imagery 3 - In home (preparing a meal)
8	Guided Imagery 4 - Cleaning the house
9	Guided Imagery 5 - Walking to neighbor's house
10	Guided Imagery 6 - Walking around neighborhood
11	Guided Imagery 7 - Walking around a park
12	Guided Imagery 8 - Walking around grocery store
13	Guided Imagery 9 - Walking on a rainy day
14	Guided Imagery 10 - Walking on an icy day
15	Guided Imagery 11 - Walking on a beach

The first relaxation technique is called Progressive Muscle Relaxation (PMR; Jacobson, 1974), which is a procedure that teaches individuals to relax their whole body through a two-step process. Specifically, one must deliberately apply tension to certain muscle groups, then stop the tension, and turn one's attention to notice how the muscles relax as the tension flows away (see Appendix K for draft). The second relaxation technique is called deep breathing. Deep breathing is breathing deeply into your lungs by flexing your diaphragm, rather than breathing shallowly by flexing your rib cage. Deep breathing has been used in many therapies for treating hyperventilation and anxiety disorders (Appendix L).

The 11 guided imagery tracks consisted of Activities of Daily Living (ADL) around the house, walking to a neighbor's house, walking around the neighborhood, walking around a park, walking around a grocery store, walking on a rainy day, walking on an icy day, and walking on a beach. As the track progresses, the activities are more difficult for adults who have an FOF. The reason why the author decided to start out with simpler tasks (e.g., waking up in the morning and going to the bathroom) in the beginning of the CD was to first familiarize participants with imagery and also slowly give participants confidence so they could actually do the activity without an FOF. It is easier to start out with simpler tasks in the beginning and, as participants progressed through the tracks, they could get more confident of doing more difficult tasks (e.g., walking on an icy road) without having an FOF (see Appendix M for all imagery drafts).

An instruction booklet (Appendix N) that explained what track to listen to on a certain day and a checklist (Appendix O) to monitor their progress during the six weeks were given along with the GREI CD. The researcher also emphasized to the participants while giving out the CDs to only listen to the given track on the given day as instructed in the instruction booklet. This was an

important factor of the study and the researcher asked participants to sign a trust agreement letter (Appendix P) stating that they would only listen to the given track on a given day listed in the instruction booklet.

Groups 3 and 4: No Fear of Falling - Intervention Group (No FOF - IG) and No Fear of Falling - Placebo Control Group (No FOF - PCG)

Groups three and four were participants who did not have a fear of falling. The reason why these groups were added was for comparison with the FOF groups. With these comparisons the researcher could examine if the GREI CD had an effect on lowering FOF and to see what similarities and significant differences there might be between these groups. The same materials in group one were given to group four and the same materials for group two were given to group three.

Procedures

This was a six week study with two extra days for pre and post testing. From a meta-analysis in Guided Imagery (GI) research done by Van Kuiken (2004), GI has been shown to be effective from interventions as short as three days, to as long as 12 weeks. Morone and Greco (2004) did a study on the effectiveness of GI and PMR in different lengths of interventions and found no significant difference from a six week intervention study to a 12 week

intervention study. Participants in both groups (e.g., six week, 12 week) were asked to do 10 minute GI sessions with PMR twice a week. Therefore, for the purposes of this study, participants were asked to do 10 minute GREI sessions two times a week, for six weeks. Participants were instructed to be consistent with the time and day that they were listening to the CDs during the six weeks. For example, if participants listened to the GREI CD on Mondays and Wednesdays at 9:00 am, they were asked to listen to the CD at those times during the six week intervention period.

Participants met with the researcher individually at a local church or senior center on a pre-scheduled meeting time. The study began with a brief introduction of the researcher, participant, and the purpose of the study. The researcher then asked the participants to fill out informed consents. After the informed consents were completed, the researcher asked participants to fill out the demographic/screening form. If participants could not read or needed assistance, the researcher asked the questions verbally. If participants answered 'yes' to certain questions on the demographic/screening form, they were excluded from the study (please see the inclusion/exclusion criteria above for more information).

If participants qualified and agreed to do the study, they filled out the EII (Giacobbi et al., 2005), Short FES-I (Kempen et al., 2008), ABC Scale (Powell & Myers, 1995), and the LTEQ (Godin & Shephard, 1985). Each questionnaire took approximately 5-10 minutes to complete. After the questionnaires were completed, the researcher administered two simple performance measures, which were the TUG (Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000) and the OLS (Berg et al., 1989). These performance measurements were used in previous FOF studies and showed positive relationships to confidence levels of performing the tests without falling. A spotter other than the researcher (e.g., volunteer at a senior center) stood next to the participants at all times while performing the mobility tests.

After filling out the questionnaires and performing the mobility tests, participants were placed in one of the four groups listed above (see control and intervention groups) by the researcher. The 1QFOF asked in the demographics/screening form was used to select participants into a certain group. If participants answered 'yes' to the 1QFOF, they were randomly placed in either groups one or two (see Figure 1 for group descriptions). If participants answered 'no' to the 1QFOF, they were randomly

placed in either groups three or four. If participants were placed in groups one and four, they were randomly placed in the placebo control groups. In the placebo control groups, participants were given a placebo audio CD that consisted of one introductory track and two guided relaxation tracks (same relaxation tracks given in the intervention group). They were also instructed to listen to music for five minutes of their choice after listening to a relaxation track. Participants listened to the relaxation track and songs of their choice for six weeks, two times a week (days of their choice but had to be consistent days throughout the six weeks), and for 10 minutes a session (time of their choice but had to be consistent times throughout the six weeks). After listening to one of the two relaxation tracks, they were asked to listen to different music during each of the 12 days.

Participants were also given instruction booklets and checklists to monitor their progress during the six weeks. Participants who were in the placebo control group received GREI audio CDs and instruction booklets after they completed post-testing.

Participants in groups two and three were the intervention groups. For these groups, the same procedures were given as to the placebo control groups but, instead of a placebo audio CD, participants were given an audio GREI CD created by the researcher. This CD consisted of one introduction track, two guided relaxation tracks, and 11 guided imagery tracks. The participants were also given an instruction booklet and a checklist to monitor their progress. More explanation is given in the 'Control and Intervention Groups' section.

The participants listened to the CD two times (only once a day) a week for six weeks. The researcher emphasized while giving out the CD to only listen to the given track on the given day as instructed in the instruction booklet. This was an important factor in the study and participants were asked to sign a trust agreement letter (Appendix Q) stating that they would only listen to the given tracks on the given days in the instruction booklet. After the six weeks, the researcher met with the participants and gave the same measurements that were given in the pretest (Table 2).

Table 2. Overall Procedure

Weeks	Days	Groups	Procedure
Pre	Day 1		Introduction to the study and researcher Fill out informed consent Ask questions from demographic/screening form Ask to fill out four questionnaires (EII, Short FES-I, ABC, LTEQ) Ask to perform two mobility tests (TUG, OLS) Give instructional booklet and checklist GREI CD for IG ^a and Give classical CD for PCG ^b
Week 1	Day 2, 3	IG ^a PCG ^b Both	Introduction to GREI CD track 1 and 2 Guided relaxation track 3 or 4 and Imagery CD track 5 Classic music CD track 1, 2 Write progress on checklist
Week 2	Day 4, 5	IG PCG Both	Guided relaxation track 3 or 4 and Imagery CD track 6, 7 Classic music CD track 3, 4 Write progress on checklist
Week 3	Day 6, 7	IG PCG Both	Guided relaxation track 3 or 4 and Imagery CD track 8, 9 Classic music CD track 5, 6 Write progress on checklist
Week 4	Day 8, 9	IG PCG Both	Guided relaxation track 3 or 4 and Imagery CD track 10, 11 Classic music CD track 7, 8 Write progress on checklist
Week 5	Day 10, 11	IG PCG Both	Guided relaxation track 3 or 4 and Imagery CD track 12, 13 Classic music CD track 9, 10 Write progress on checklist
Week 6	Day 12, 13	IG PCG Both	Guided relaxation track 3 or 4 and Imagery CD track 14, 15 Classic music CD track 11, 12 Write progress on checklist

Table 2. (Continued)

Weeks	Days	Groups	Procedure
Post	Day 14		Ask to fill out four questionnaires (EII, Short FES-I, ABC, LTEQ) Ask to perform two mobility tests (TUG, OLS) Hand in checklist Final remarks

^aIG = Intervention Group, ^bPCG = Placebo Control Group

Pilot Study

The following reasons for a pilot study were: (a) to clarify and practice the experimental procedures used in the actual study, (b) to find what Guided Relaxation and Exercise Imagery (GREI) method (e.g., verbal, cassette tape, audio CD) was most preferred by participants, (c) to use GREI as an intervention tool and find if it lowers FOF, (d) to find if GREI improves self-efficacy and confidence in relation to FOF, (e) to find if GREI helps increase the rates of exercise imagery use, (f) to find if GREI improves rates of specific mobility tests, and (g) to get general feedback comments from the participants.

A total of six participants (Age $M = 69.83$, $SD = 4.75$) aged from 65 to 78 years of age were included in this pilot study. Table 3 depicts the demographic information.

Table 3. Demographic Information for Pilot Study

Participant	A	B	C	D	E	F
GENDER	F	F	F	M	F	F
AGE	66	72	68	65	78	70
ETHNICITY	AA ¹	AA	AA	AA	AA	AA
ADDITIONAL COMMENTS	-Bad vision -HBP ² -Good health	-Use assistive device (cane) -HBP -Good health	-Bad vision -Good health	-HBP -Good health	-Fallen exp. (indoors) -Use assistive device (walker) -Bad vision -Dizziness -Fair health	-Poor leg strength -Bad vision - -Arthritis -Hearing problem -Good health

AA¹ = African American, HBP² = High Blood Pressure

All of the participants had an FOF and two reported that FOF limited them from doing activities. All of the participants wore prescription glasses (e.g., bifocals) and, when asked about their physical health, they all responded that they wanted to be more active than they presently were.

Procedures for Pilot Study

The procedures were similar to the actual study and approved by Temple University's Institutional Review Board (IRB protocol # 11701). The participants met with the researcher at a local senior care center on pre-arranged meeting times for pre and post testing. At the beginning of the study, the researcher went over the informed consent and explained the details of the study. Then, the researcher asked if the participants had an FOF. If they

answered yes, they were asked for their participation in the study. If yes, they were asked to complete a demographics form and four questionnaires regarding their: (a) imagery use (EII; Giacobbi et al., 2005), (b) efficacy levels related to falls (FES-I; Yardley et al., 2005), (c) confidence levels performing various activities without falling (ABC Scale; Powell & Myers, 1995), and (d) perceived length (in days) of exercise during a given week (LTEQ; Godin & Shephard, 1985). Each questionnaire took approximately 5-10 minutes to complete. After filling out the questionnaires, two simple performance measures: (a) TUG (Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000) and (b) OLS (Berg et al., 1989) up to 30 seconds were administered.

After the assessments, the researcher gave participants an option on how they wanted their guided imagery to be delivered. The options were: (a) imagery script read by the researcher, (b) Internet audio file (e.g., mp3), (c) pre-recorded cassette tape or audio CD, or (d) actual imagery scripts. All the participants opted to get an audio CD. An instructional booklet and a pre-made audio GREI CD was given to the participants. The instructional booklet explained how to use the CD and the following four tracks were included in the GREI audio CD:

(a) an introduction to GREI, (b) Progressive Muscle Relaxation (PMR; Jacobson, 1974), (c) two guided exercise imagery tracks that included walking around the house and neighborhood. To avoid having participants not listening to the audio CD, they were asked to sign a separate form stating that they would follow instructions and use the GREI audio CD three times a week, only once per day, for 15 to 20 minutes.

Two weeks after the pretest, the researcher met with the participants and administered the same questionnaires and mobility tests given in the pretest. Final remarks were given and participants were given time to comment about the whole experience of the study. Table 4 gives an overall view of the pilot study procedures.

Table 4. Overview Procedures of Pilot Study

Meeting Time	Days	Procedure
First meeting	Day 1	Introduction to the study, researcher Fill out informed consent Ask questions from demographic/screening form (inclusion/exclusion criterion) Ask to fill out four questionnaires (EII, FES-I, ABC, LTEQ) Ask to perform two mobility tests (TUG, OLS)
Week 1	Day 2	15-minute guided relaxation/imagery 1
	Day 3	15-minute guided relaxation/imagery 2
	Day 4	15-minute guided relaxation/imagery 3
Week 2:	Day 5	15-minute guided relaxation/imagery 4
	Day 6	15-minute guided relaxation/imagery 5
	Day 7	15-minute guided relaxation/imagery 6
Final Meeting	Day 8	Ask to fill out four questionnaires (EII, FES-I, ABC, LTEQ) Ask to perform two mobility tests (TUG, OLS)

Results for Pilot Study

Table 5 gives an overall result for each measurement and mobility test.

Table 5. Results for Pilot Study

MEASUREMENTS /PARTICIPANTS	A	B	C	D	E	F	MEAN	STD DEV
EII Pre Total Score	49.00	40.00	45.00	50.00	53.00	52.00	48.16	4.88
EII Post Total Score	74.00	63.00	69.00	73.00	72.00	68.00	69.83	4.07
ABC Pre AVG %	76.56	82.19	70.31	76.56	47.51	56.91	68.34	13.39
ABC Post AVG %	74.42	80.75	57.56	76.19	47.81	57.53	65.71	13.16
FES-I Pre Total Score	18.00	27.00	17.00	19.00	33.00	21.00	22.50	6.25
FES-I Post Total Score	26.00	36.00	30.00	24.00	54.00	32.00	33.67	10.84
LTEQ Pre Total Score	37.00	43.00	48.00	57.00	3.00	22.00	35.00	19.57
LTEQ Post Total Score	51.00	43.00	45.00	59.00	8.00	34.00	40.00	17.75
TUG Pre (in seconds)	14.00	12.00	7.00	9.00	15.00	10.00	11.17	3.06
TUG Post (in seconds)	9.00	9.00	7.00	5.00	12.00	8.00	8.33	2.34
OLS Pre (in seconds)	12.00	23.00	15.00	30.00	4.00	18.00	17.00	8.99
OLS Post (in seconds)	7.00	21.00	28.00	25.00	3.00	23.00	17.83	10.28

In a repeated measures study, the interest is to find whether or not there is a systematic difference between the scores in the first treatment condition and the scores in the second treatment condition. The best way to compare the difference for one sample is performing a *t-test* for repeated measures (Gravetter & Wallnau, 2004). Therefore, for the purposes of this pilot study, a simple *t-test* for

repeated measures was calculated (Table 6). All data analyses were performed using SPSS version 11.5 (2002).

Table 6. Data Analysis for Pilot Study

Measurements (Pre/Post)	df	Paired Differences		t
		Mean	Std. Deviation	
EII pre - EII post		21.67	3.44	15.41
ABC pre - ABC post		2.63	5.06	1.28
FES-I pre - FES-I post	5	11.17	5.52	4.95
LTEQ pre - LTEQ post		5.00	6.75	1.81
TUG pre - TUG post		2.83	1.72	4.03
OLS pre - OLS post		0.83	6.99	0.29

The critical region with $\alpha = .05$ and $df = 5$ began at +2.571 and ended at -2.571 in the t distribution. A two-week intervention study that used a GREI audio CD as an intervention tool resulted in a significant increase ($M = 21.67$, $SD = 3.44$) in scores in the EII ($M = 21.67$, $SD = 3.44$, $t(5) = 15.42$, $p < .05$), the FES-I ($M = 11.17$, $SD = 5.52$, $t(5) = 4.95$, $p < .05$), and significant drop in time for the TUG ($M = 2.83$, $SD = 1.72$, $t(5) = 4.03$, $p < .05$). Using a GREI audio CD for two weeks did not result in any significant differences in scores for the ABC scale and LTEQ. There were also no significant differences in time for the OLS.

Final Remarks/Comments

At the end of the post-test, participants were asked to comment about the pilot study. Some comments were: assessments being too lengthy (e.g., FES - I), too many assessments, the need for more imagery tracks on the CD, fewer days per week to listen to the CD (e.g., two times per week instead of three times), fewer minutes to listen to the CD (e.g., 5 to 10 minutes per session instead of 15 to 30 minutes), and making a checklist for monitoring.

Overall, the two week intervention study resulted in significant increases in scores of the EII and FES - I and a significant drop in seconds for the TUG. Results showed that the GREI CD might have effects increasing the use of exercise imagery and giving participants higher self-efficacy in relation to FOF. Although there were not any significant differences in ABC scale and LTEQ scores, a longer intervention period, which was assessed for the actual study, might show significant differences. Also, a reason why there was not a significant difference in the OLS might be because participants were not used to standing on one leg. It was interesting to find what a longer, more detailed GREI CD had to offer and how it compared with participants who did not receive a GREI CD and participants who did not have a FOF. It was also interesting to find if

there were any differences between ethnicities as the pilot study involved all African Americans and the actual study examined older adults with different ethnicities.

Data Analysis

This study had six dependent variables. Two of the dependent variables consisted of results from mobility tests (e.g., TUG and OLS). The four other dependent variables were total scores from questionnaires (e.g., EII, Short FES-I, ABC, and the LTEQ). All six dependent variables were on at least interval scales of measurement.

As for determining the number of participants for recruitment, a priori power was estimated for six ANCOVA's, one for each dependent variable in the study. Some of the research hypotheses were one way directional but for the purposes of the study, analyses used a two-tailed alpha level set to .05. Overall power was set to .80, meaning the study had an 80% probability of finding a significant difference if such differences existed in the population. Equal sample sizes were assumed. Results showed an overall sample size of at least 180 participants to be recruited (at least 45 per group). This sample size was selected as the smallest sample that would be important to detect a significant difference.

The goal of the study was to find if using GREI techniques would help lower FOF among community dwelling older adults aged 60 and above. Six dependent variables were used among four conditions: (1) Fear of Falling - Placebo Control Group (FOF-PCG), (2) Fear of Falling - Intervention Group (FOF-IG), (3) No Fear of Falling Intervention Group (No FOF-IG), and (4) No Fear of Falling - Placebo Control Group (No FOF-PCG). Participants were selectively and randomly assigned to the conditions. Each of the dependent variables was collected twice: once at the outset of the study and again at the end of the six-week intervention. Consequently, the study incorporated one between-subjects factor (condition) and one within-subjects factor (time period). The between-subjects factor had four levels and the within-subjects factor had two levels. There were two analyses done in this study: (a) paired samples t-test and (b) an analyses of covariance (ANCOVA). All data analyses were performed using SPSS version 17 (2008).

The simplest way to compare the difference is performing a t-test for repeated measures (Gravetter & Wallnau, 2004). Therefore, for the purposes of this study, a paired samples t-test for repeated measures was calculated. Paired sample t-tests were conducted with each

of the mean scores/times (pretest and posttest) of the dependent variables in the four groups. An extra paired samples t-test was also conducted for the One Question Fear of Falling (1QFOF) for the four groups. In a repeated measures study, the main interest is to find whether or not there is a systematic difference between the scores in the first treatment condition and the scores in the second treatment condition.

The traditional approach analyzing data for this research design was a univariate, repeated-measures analysis of variance (ANOVA). However, a primary assumption underlying repeated-measures analyses is that performance on the dependent variable is equivalent among groups at the time of the pretest (Wickens & Keppel, 2004). This assumption was evaluated by completing six one-way ANOVAs, one for each pretest measure. Results for this study showed statistically-significant differences among the four groups on all six pretest scores: EII-PRE ($F[3, 180] = 9.093, p = .001$), ABC-PRE ($F[3, 180] = 82.736, p = .001$), FESI-PRE ($F[3, 180] = 138.058, p = .001$), LTEQ-PRE ($F[3, 180] = 5.167, p = .001$), TUG-PRE ($F[3, 180] = 42.126, p = .001$), and OLS-PRE ($F[3, 180] = 17.075, p = .001$).

Consequently, there would have been a violation of underlying assumptions had the proposed repeated-measures ANOVAs been implemented. The problem was overcome by the following recommendations in leading textbooks on analyzing data from repeated measures designs (Maxwell & Delaney, 2004; Wickens & Keppel, 2004). Specifically, results were investigated using six analyses of covariances (ANCOVAs). In each instance, pretest scores served as the covariate. The covariate operated to diminish group differences on the dependent variable at the time of the pretest. Thereby, the pretest covariates functioned to equate groups on the dependent variable at the outset of the study. Post hoc comparisons were completed on adjusted posttest scores and the Type I, family-wise error rate was apportioned using the Bonferroni adjustment (Field, 2009).

CHAPTER 4

RESULTS AND DISCUSSION

The main purpose of this study was to examine the effects of a six-week intervention that used Guided Relaxation and Exercise Imagery (GREI) techniques on reducing Fear of Falling (FOF) rates among community dwelling adults aged 60 and above. A secondary purpose was to study the effects of GREI techniques on self-efficacy, self-confidence, exercise imagery use, perceived exercise levels, and specific simple mobility tests.

Demographic Information

An overview of the demographic information is provided in Table 7. A total of 184 (*mean age: 73.27, standard deviation (SD): 8.69, range: 60 - 92, mode: 72*) participants were recruited in this study. Two groups had 45 participants (Groups 1, 4), one group had 48 participants (Group 3), and one group had 46 participants (Group 2). Overall, 62 males and 122 females participated in this study. By race, 68 participants reported themselves as African American, 66 as Asian, 41 as Caucasian, seven as Latino, and two as other.

Table 7. Demographic Information

	OVERALL	GROUP 1*	GROUP 2*	GROUP 3*	GROUP 4*
<u>GENDER:</u>					
MALE:	62.00	27.00	17.00	22.00	5.00
FEMALE:	122.00	18.00	29.00	26.00	40.00
<u>AGE:</u>					
Mean	73.27	75.93	76.43	70.56	70.93
SD	8.69	8.23	8.48	8.73	8.94
<u>RACE:</u>					
AFRICAN AMERICAN	68.00	13.00	19.00	21.00	15.00
ASIAN	66.00	17.00	12.00	14.00	23.00
CAUCASIAN	41.00	14.00	13.00	8.00	6.00
LATINO	7.00	1.00	2.00	4.00	0.00
OTHER	2.00	0.00	0.00	1.00	1.00

*Group 1: Fear of Falling (FOF) - Placebo Control Group (PCG), Group 2: FOF - Intervention Group (IG), Group 3: NoFOF - IG, Group 4: NoFOF - PCG

In Group 1 ($n = 45$, *mean age: 75.93*, *SD: 8.23*), there were 18 males and 27 females. By race, 13 participants reported themselves as African American (AA), 17 as Asian, 14 as Caucasian, and one as Latino. In Group 2 ($n = 46$, *mean age: 76.43*, *SD: 8.48*), there were 17 males and 29 females. By race, 19 reported themselves as AA, 12 as Asian, 13 as Caucasian, and two as Latino. In Group 3 ($n = 48$, *mean age: 70.56*, *SD: 8.73*), there were 22 males and 26 females. By race, 21 reported themselves as AA, 14 as Asian, eight as Caucasian, four as Latino, and one as other. In Group 4 ($n = 45$, *mean age: 70.93*, *SD: 8.94*), 40 males and five females. By race, 15 reported themselves as AA, 23 as

Asian, six as Caucasian, and one as other. A Pearson Chi-square analysis was conducted to find any significant differences in gender and race among the four groups. There was no significant difference among the four groups in race ($\chi^2(12) = 17.77, p = .123$), but there was a significant difference among the four groups in gender ($\chi^2(3) = 14.49, p = .002$). A one-way ANOVA revealed that age was also significantly different among the four groups ($F[3, 180] = 7.784, p = .01$). Using a Bonferroni post hoc analysis, Group 1 had a significant age difference with Groups 3 and 4. Group 2 also had a significant age difference with Groups 3 and 4. There was no significant age difference between Groups 1 and 2.

Results from the Demographic/Screening Form

As shown in Table 8, overall results are presented for each question from the demographic/screening form (Appendix B). The majority of subjects (58/91 or 63.7%) with an FOF reported their health to be fair and had a higher number of falls as compared to the No FOF group, 38 and 12 respectively. The FOF group also self-reported a greater number of health related problems, including cane and walker use (18.5% FOF vs. 4.3% No FOF); balance problems (32.1% FOF vs. 10.9% No FOF); and high blood pressure (22.8% FOF vs. 7.1% No FOF). The FOF group also self-

reported lower activity levels: e.g., restrict activities (33.1% FOF vs. 14.7% No FOF; and felt they should be more physically active than they were (41.8% FOF vs. 22.8% No FOF).

Table 8. Results of Demographic/Screening Form

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Q1: FALL (1M)?</u>					
YES	42	19	16	5	2
NO	142	26	30	43	43
IF YES,					
INDOOR	30	14	10	4	2
OUTDOOR	12	5	6	1	0
GET UP?					
YES	40	19	14	5	2
NO	2	0	2	0	0
FRACTURE?					
YES	1*	0	1	0	0
NO	41	19	15	5	2
HOSPITAL?					
YES	1	0	1	0	0
NO	41	19	15	5	2
<u>Q2: POOR STRENGTH?</u>					
YES	104	35	27	29	13
NO	80	10	19	19	32
<u>Q3: ASSIST DEVICE?</u>					
YES	60	17	25	11	7
NO	124	28	21	37	38
DEVICES:					
CANE	42	15	19	7	1
WALKER	12	2	3	3	4
WHEELCHAIR	3	0	1	0	2
OTHER	3	0	2	1	0
<u>Q4: EYESIGHT?</u>					
YES	177	43	45	45	44
NO	7	2	1	3	1
Glasses?					
YES	176	43	45	44	44
NO	1	0	0	1	0
<u>Q5: DISCOMFORT?</u>					
YES	60	23	26	9	2
NO	124	22	20	39	43

*denotes being treated

Table 8. (continued)

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Q5:</u>					
<u>DISCOMFORT?</u>					
YES	60	23	26	9	2
NO	124	22	20	39	43
<u>Q6: BALANCE</u>					
<u>PROB?</u>					
YES	79	27	32	13	7
NO	105	18	14	35	38
<u>Q7: LIGHTHEAD?</u>					
YES	77	26	31	13	7
NO	107	19	15	35	38
<u>Q8:</u>					
<u>PARKINSON'S?</u>					
YES	1*	0	1	0	0
NO	183	45	45	48	45
<u>Q9: HEART</u>					
<u>CONDITION?</u>					
YES	122	36	37	27	22
NO	62	9	9	21	23
HBP?					
YES	55	23	19	10	3
NO	67	13	16	17	19
HYPERTENSION?					
YES	24	8	12	3	1
NO	98	28	25	24	21
STROKE?					
YES	5	1	3	1	0
NO	117	35	34	26	22
DIABETES?					
YES	14	7	2	3	1
NO	170	38	44	45	44
RESTRICTED					
ACTIVITIES?					
YES	88	30	31	22	5
NO	96	15	15	26	40
<u>Q10: OSTEO/RA?</u>					
YES	53*	16	14	13	10
NO	131	29	32	35	35
SEVERE RA?					
YES	2*	0	2*	0	0
NO	51	16	12	13	10

*denotes being treated

Table 8. (continued)

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Q11:</u>					
<u>DRUG/ALCOHOL</u>					
YES	3	1	1	0	1
NO	181	44	45	48	44
<u>Q12: HEARING</u>					
<u>PROB?</u>					
YES	99	33	29	25	12
NO	85	12	17	20	33
<u>Q13:</u>					
<u>ALZHEIMER'S?</u>					
YES	3*	0	2*	1*	0
NO	181	45	44	47	45
<u>Q14: FOF?</u>					
YES	91	45	46	0	0
NO	93	0	0	48	45
LIMIT					
ACTIVITIES?					
YES	44	30	14	0	0
NO	47	15	32	0	0
<u>Q15:</u>					
<u>PHYSICALLY</u>					
<u>ACTIVE?</u>					
YES	119	39	38	26	16
NO	65	6	8	22	29
<u>Q16: MEDS FOUR</u>					
<u>OR MORE?</u>					
YES	46	14	26	4	2
NO	138	31	20	44	43
<u>Q17: HEALTH?</u>					
EXCELLENT	27	2	3	9	13
GOOD	52	4	8	17	23
FAIR	88	33	25	21	9
POOR	17	6	10	1	0
<u>Q18: FALL IN</u>					
<u>LAST 3M?</u>					
YES	50	21	17	8	4
NO	134	24	29	40	41

*denotes being treated

Results for Research Hypotheses

The following explains the results for each of the research hypotheses (RH) examined in this study:

Results for RH1

RH1. There will be a significant decrease in FOF levels by a six-week intervention program using GREI techniques for Group 2. There will be no significant differences for Groups 1, 3, and 4.

For the purposes of this study, the 1 Question Fear Of Falling (1QFOF) was asked pretest and posttest to examine if GREI techniques helped decrease FOF among the participants. Question 14 from the demographic/screening form (Appendix B) asked if the participant had an FOF. In the initial meeting, 91 participants responded 'yes' and 93 participants responded 'no.' Table 9 depicts results from the 1QFOF.

After the six week intervention, the 1QFOF was asked again and six out of the 45 participants in Group 1 who said 'yes' at the pretest, said 'no' at the posttest. For Group 2, 36 out of the 46 participants who said 'yes' at the pretest, said 'no' at the posttest. For Group 3, one out of the 48 participants who said 'no' during the pretest said 'yes' at the posttest. In Group 4, everyone said 'no' at the posttest.

Table 9. Results of 1QFOF

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>FOF?</u>					
Pretest:					
Yes	91	45	46	0	0
No	93	0	0	48	45
Posttest (after 6-wks):					
Yes	50	39	10	1	0
No	133	6	36	47	45

A paired samples t-test was completed for each group where the pretest and posttest responses to the 1QFOF served as the basis for comparison. Results showed a significant difference in responses for Groups 1 ($t[44] = -2.60, p = .013$) and 2 ($t[45] = -12.73, p = .001$), but no significant difference in responses for Groups 3 and 4. Table 10 depicts the paired samples t-test for the 1QFOF.

Table 10. Paired Sample t-test for 1QFOF

GROUP	t	df	Sig. (2-tailed)
1	-2.60	44	.01
2	-12.73	45	.01
3	1.00	47	.32
4	NC*	NC*	NC*

NC* = No change in responses from pretest and posttest

Results for RH2

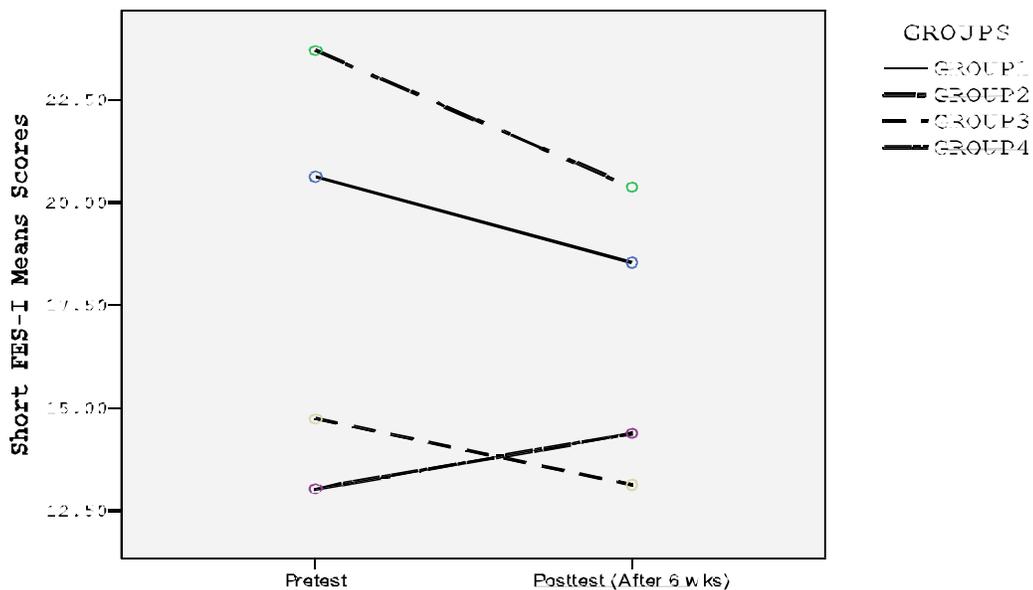
RH2. GREI techniques will result in a significant improvement in self-efficacy for Group 2. There will be no significant differences for Groups 1, 3, and 4.

The Short Falls Efficacy Scale - International Version (FES - I; Kempen et al., 2008) was used to measure efficacy levels in relation to FOF. Pretest and posttest means and standard deviations for each group are depicted in Table 11. Figure 2 shows a graph that compares the Short FES-I mean scores pretest and posttest amongst the groups.

Table 11. Pretest and Posttest Mean Scores and Standard Deviations for the Short FES-I

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Pretest:</u>					
Short FES-I					
Mean Score	18.01	20.62	23.69	14.72	13.02
SD	2.78	3.22	1.68	3.46	2.78
<u>Posttest</u>					
<u>(After 6 wks):</u>					
Short FES-I					
Mean Score	16.60	18.53	20.36	13.12	14.37
SD	3.26	3.34	3.66	2.97	3.06

Figure 2. Short FES-I Pretest and Posttest Mean Scores for all Groups



A paired samples t-test was done for each group where the pretest and posttest scores for the Short FES-I served as the basis for comparison. Table 12 depicts the paired samples t-test for the Short FES-I amongst the four groups.

Table 12. Paired Samples t-test for the Short FES-I

Paired Differences						
Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig (2-tailed)
1	2.09	4.06	.605	3.46	44	.001*
2	3.33	3.37	.496	6.70	45	.001*
3	1.60	4.53	.654	2.46	47	.018*
4	-1.36	4.27	.637	-2.12	44	.039*

*significant difference at $p < .05$

Results from Table 13 depict that all of the four groups had significant differences in mean scores pretest and posttest for the Short FES-I (Group 1: $t[44] = 3.46$, $p = .001$; Group 2: $t[45] = 6.70$, $p = .001$; Group 3: $t[47] = 2.46$, $p = .018$; Group 4: $t[44] = -2.12$, $p = .039$)

An analysis of covariance (ANCOVA) was performed to covary the pretest scores. ANCOVA results for the Short FES-I is depicted below in Table 13.

Table 13. ANCOVA for the Short FES-I

Source	SS	df	Mean Square	F	Sig.	η^2
Short FES-I PRE	28.05	1	28.05	2.65	.11	.02
GROUPS	418.20	3	139.40	13.19	.01	.18
Error						
Corrected	1891.70	179				
Total	3543.22	183				

Table 14 depicts the unadjusted and adjusted means of the posttest mean score of the Short FES-I. ANCOVA made little adjustment to the posttest means. More importantly, the ANCOVA on the adjusted Short FES-I posttest scores was statistically significant ($F[3, 178] = 13.19, p = .001$). The obtained effect for Short FES-I posttest scores represented a large effect size (partial eta squared, $\eta^2 = .18$). Murphy and Myers (2004) defined the ranges of η^2 for small (.01), medium (.06), and large (.14) effect sizes.

Table 14. Posttest Mean Scores for Unadjusted and Adjusted Short FES-I Values Among the Four Groups

Group	Unadjusted (Observed) Mean	Adjusted (Covaried) Mean
1	18.53	18.29
2	20.36	19.57
3	13.12	13.62
4	14.37	14.88

Post hoc testing for the Short FES-I mean scores are shown in Table 15. Post hoc testing disclosed that Group 2 had the highest adjusted posttest scores on the Short FES-I. Group 2 obtained significantly higher adjusted posttest scores than Group 3 ($p = .001$) and Group 4 ($p = .001$). However, there was no significant difference between Group 2 and Group 1 ($p = .32$). Group 1 had the second highest adjusted posttest scores on the Short FES-I. Group 1

obtained significantly higher posttest scores than Group 3 ($p = .001$) and Group 4 ($p = .001$). Lastly, there was no significant difference between Group 3 and 4 ($p = .195$).

Table 15. Post Hoc Testing for the Short FES-I Post Mean Scores

GROUP	GROUPS	Mean Diff.	Std. Error	Sig.	95% CI	
					Lower	Upper
GROUP1	GROUP2	-1.415	.729	.323	-3.360	.530
	GROUP3	4.600*	.837	.000	2.366	6.834
	GROUP4	3.113*	.938	.007	.612	5.615
GROUP2	GROUP1	1.415	.729	.323	-.530	3.360
	GROUP3	6.015*	1.010	.000	3.320	8.709
	GROUP4	4.528*	1.128	.001	1.519	7.537
GROUP3	GROUP1	-4.600*	.837	.000	-6.834	-2.366
	GROUP2	-6.015*	1.010	.000	-8.709	-3.320
	GROUP4	-1.487	.690	.195	-3.327	.353
GROUP4	GROUP1	-3.113*	.938	.007	-5.615	-.612
	GROUP2	-4.528*	1.128	.001	-7.537	-1.519
	GROUP3	1.487	.690	.195	-.353	3.327

*The mean difference is significant at the .05 level

Results for RH3

RH3. GREI techniques will result in a significant improvement in confidence for Group 2. There will be no significant difference for Groups 1, 3, and 4.

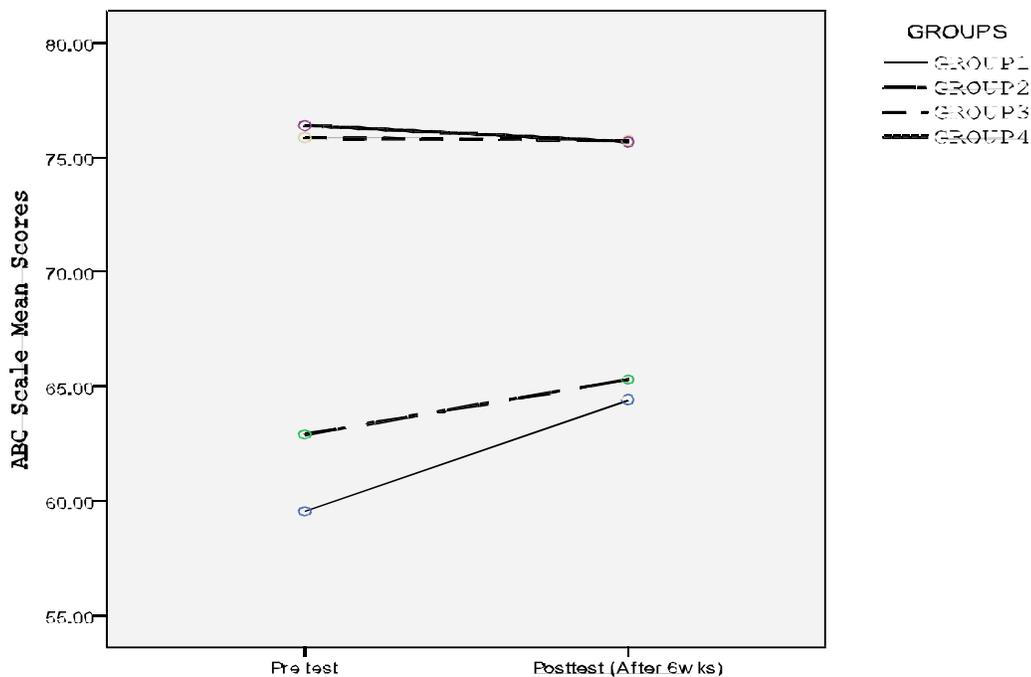
Confidence of doing daily activities without a fear of falling was measured using the Activities Balance and Confidence Scale (ABC Scale; Powell & Myers, 1995). Simple mean and standard deviation comparisons among the pretest and posttest scores are presented in Table 16.

Table 16. Pretest and Posttest Mean Scores and Standard Deviations for the ABC-Scale

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Pretest:</u>					
ABC Scale					
Mean Score	68.68	59.55	62.91	75.85	76.41
SD	6.29	7.00	8.66	4.72	4.76
<u>Posttest</u>					
<u>(After 6 wks):</u>					
ABC Scale					
Mean Score	72.73	64.42	65.31	75.74	75.69
SD	5.07	5.01	6.09	4.82	4.34

Figure 3 shows a graph that compares the ABC Scale mean scores pretest and posttest amongst the groups.

Figure 3. ABC Scale Pretest and Posttest Mean Scores for all Groups



A paired samples t-test was done for each group where the pretest and posttest scores for the ABC Scale served as the basis for comparison. Table 17 depicts the paired samples t-test for the ABC Scale amongst the four groups.

Table 17. Paired Samples t-test for the ABC Scale

Paired Differences						
Group	Mean	Std. Deviation	Std. Error Mean	t	Group	Mean
1	-4.87	7.17	1.07	-4.56	44	.001*
2	-2.40	9.05	1.33	-1.80	45	.079
3	.109	7.30	1.05	.104	47	.918
4	.717	7.11	1.06	.677	44	.502

*significant difference at $p < .05$

Results from Table 18 show that Group 1 ($t[44] = -4.87$, $p = .001$) had a significant difference in mean scores pretest and posttest for the ABC Scale. Groups 2, 3, and 4 did not have significant differences in mean scores pretest and posttest for the ABC Scale (Group 2: $t[45] = -2.40$, $p = .079$; Group 3: $t[47] = .104$, $p = .918$; Group 4: $t[44] = .677$, $p = .502$).

An analysis of covariance (ANCOVA) was performed to covary the pretest scores. ANCOVA results for the Short FES-I are shown below in Table 18.

Table 18. ANCOVA for the ABC Scale

Source	SS	df	Mean Square	F	Sig.	η^2
ABC PRE	853.01	1	853.02	20.83	.01	.10
GROUPS	699.07	3	233.02	5.69	.01	.09
Error						
Corrected	7331.20	179				
Total	13618.94	183				

Preliminary comparisons revealed that the pretest score had a significant impact on the posttest scores (ABC Pre: $F[1, 178] = 20.83, p = .001$). Table 19 presents unadjusted and adjusted means for the four groups on the second dependent variable of ABC. The obtained effect for ABC posttest scores represented a medium to large effect size (partial eta squared, $\eta^2 = .09$).

Table 19. Posttest Mean Scores for Unadjusted and Adjusted ABC Values Among the Four Groups

Group	Unadjusted (Observed) Mean	Adjusted (Covaried) Mean
1	64.42	67.51
2	65.31	67.27
3	75.74	73.37
4	75.69	73.12

Post hoc testing (Table 20) revealed Group 1 had the highest adjusted posttest scores on the ABC Scale. Group 1 had a higher significant difference in adjusted posttest score than Groups 3 ($p = .008$) and 4 ($p = .015$) but was not significantly different from Group 2. Group 2 obtained significantly lower adjusted posttest scores than Groups 3 ($p = .001$) and 4 ($p = .003$). Groups 3 and 4 had no significant difference.

Table 20. Post hoc testing for the ABC Scale Post Mean Scores

GROUP	GROUPS	Mean Diff.	Std. Error	Sig.	95% CI	
					Lower	Upper
GROUP1	GROUP2	.238	1.364	1.000	-3.402	3.879
	GROUP3	-5.857*	1.789	.008	-10.631	-1.083
	GROUP4	-5.613*	1.832	.015	-10.502	-.725
GROUP2	GROUP1	-.238	1.364	1.000	-3.879	3.402
	GROUP3	-6.095*	1.628	.001	-10.438	-1.752
	GROUP4	-5.852*	1.669	.003	-10.304	-1.399
GROUP3	GROUP1	5.857*	1.789	.008	1.083	10.631
	GROUP2	6.095*	1.628	.001	1.752	10.438
	GROUP4	.244	1.329	1.000	-3.301	3.788
GROUP4	GROUP1	5.613*	1.832	.015	.725	10.502
	GROUP2	5.852*	1.669	.003	1.399	10.304
	GROUP3	-.244	1.329	1.000	-3.788	3.301

*The mean difference is significant at the .05 level

Results for RH4

RH4. Participants will have significantly higher exercise imagery usage rates after the intervention for Groups 2 and 3. There will be no significant difference for Groups 1 and 4.

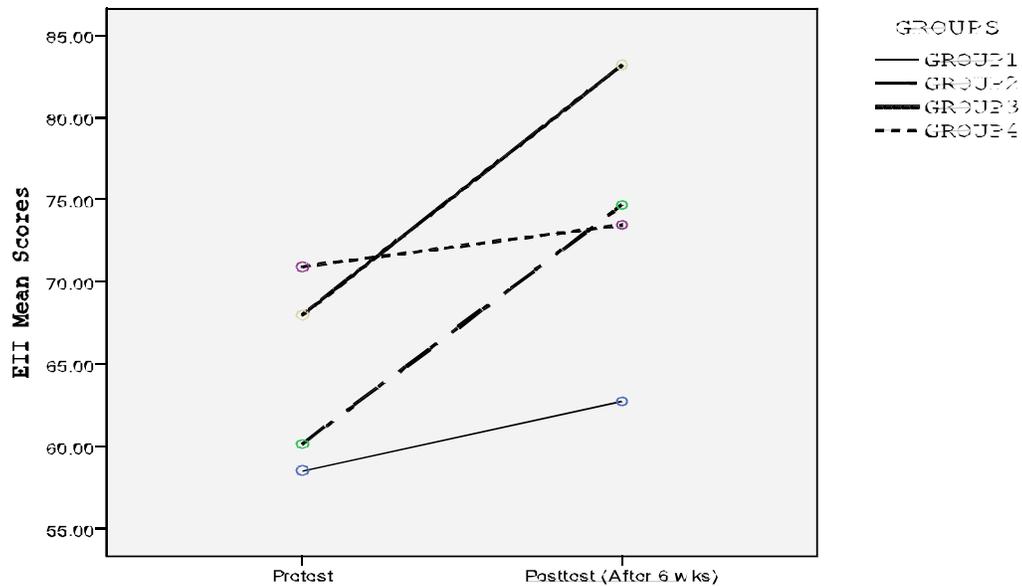
The use of exercise imagery levels was measured in this study by using the Exercise Imagery Inventory (EII; Giacobbi et al., 2005). Simple mean and standard deviation comparisons among the pretest and posttest scores are depicted in Table 21.

Table 21. Pretest and Posttest Mean Scores and Standard Deviations for the EII

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Pretest:</u>					
EII Mean					
Score	64.40	58.53	60.15	68.00	70.93
SD	13.33	10.92	13.39	13.18	15.81
<u>After 6 wks:</u>					
EII Mean					
Score	73.52	62.73	74.67	83.19	73.47
SD	12.47	13.11	11.95	15.66	9.15

Figure 4 presents a graph that compares the EII mean scores pretest and posttest amongst the groups.

Figure 4. EII Pretest and Posttest Mean Scores for all Groups



A paired samples t-test was done for each group where the pretest and posttest scores for the EII served as the basis for comparison. Table 22 depicts the paired samples t-test for the EII amongst the four groups.

Table 22. Paired Samples t-test for the EII

Paired Differences						
Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig (2-tailed)
1	-4.20	11.97	1.78	-2.35	44	.023*
2	-14.52	14.47	2.13	-6.81	45	.001*
3	-15.19	17.54	2.53	-6.00	47	.001*
4	-2.53	19.32	2.88	-0.88	44	.384

*significant difference at $p < .05$

Results from Table 23 depict that Groups 1 ($t[44] = -2.35, p = .023$), 2 ($t[45] = -6.81, p = .001$), and 3 ($t[47] = -6.00, p = .001$) had a significant difference in mean scores pretest and posttest for the EII. Group 4 ($t[44] = -.880, p = .384$) did not have a significant difference in mean scores pretest and posttest for the EII.

An analysis of covariance (ANCOVA) was performed to covary the pretest scores. ANCOVA results for the EII is depict in Table 23.

Table 23. ANCOVA for the EII

Source	SS	df	Mean Square	F	Sig.	η^2
EII PRE	1744.23	1	1744.23	11.37	.01	.06
GROUPS	7798.18	3	2599.39	16.95	.01	.22
Error						
Corrected	27451.19	179	153.35			
Total	38974.08	183				

Preliminary comparisons revealed that the pretest scores had a significant impact (adjustment) on the posttest scores (EII-Pre: $F[1, 178] = 11.37, p = .001$). Table 24 presents unadjusted (e.g., obtained) and adjusted (e.g., covaried) means for the four groups on the first dependent variable of EII.

Table 24. Posttest Mean Scores for Unadjusted and Adjusted EII Values Among the Four Groups

Group	Unadjusted (Observed) Mean	Adjusted (Covaried) Mean
1	62.7	64.1
2	74.7	75.7
3	83.2	82.4
4	74.5	71.9

More importantly, the ANCOVA on the adjusted EII posttest scores was statistically significant ($F[3, 178] = 16.95, p = .001$). The obtained effect for EII posttest scores represented a large effect size (partial eta squared, $\eta^2 = .22$).

Post hoc testing showed that Group 3 had the highest adjusted posttest scores on EII (Table 25). Group 3 obtained significantly higher adjusted posttest scores than Group 1 ($p = .001$) and Group 4 ($p = .001$). However, there was no significant difference between Group 3 and Group 2 ($p = .07$). Group 2 had the second highest adjusted posttest scores on EII. Group 2 obtained significantly higher posttest scores than Group 1 ($p = .001$), but there was no significant difference between Group 4 ($p = .99$). Lastly, Group 4 had the third highest adjusted posttest scores on EII and Group 4 obtained significantly higher posttest scores than Group 1 ($p = .039$).

Table 25. Post hoc testing for the EII Post Mean Scores

GROUP	GROUPS	Mean Diff.	Std. Error	Sig.	95% CI	
					Lower	Upper
GROUP1	GROUP2	-11.565*	2.599	.001	-18.499	-4.632
	GROUP3	-18.260*	2.651	.001	-25.332	-11.188
	GROUP4	-7.860*	2.746	.028	-15.186	-.533
GROUP2	GROUP1	11.565*	2.599	.001	4.632	18.499
	GROUP3	-6.695	2.611	.067	-13.662	.272
	GROUP4	3.706	2.700	1.000	-3.498	10.910
GROUP3	GROUP1	18.260*	2.651	.001	11.188	25.332
	GROUP2	6.695	2.611	.067	-.272	13.662
	GROUP4	10.401*	2.578	.001	3.524	17.277
GROUP4	GROUP1	7.860*	2.746	.028	.533	15.186
	GROUP2	-3.706	2.700	1.000	-10.910	3.498
	GROUP3	-10.401*	2.578	.001	-17.277	-3.524

*The mean difference is significant at the .05 level

Results for RH5

RH5. There will be a significant difference of time (seconds) in the mobility tests assessed from before to after the study for Group 2. There will be no significant difference for Groups 1, 3, and 4.

Mobility tests were assessed by the Timed Up and Go (TUG; Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000) and the One Leg Stance (OLS; Berg et al., 1989). Simple mean and standard deviation comparisons among the pretest and posttest scores are depicted in Table 26.

Table 26. Pretest and Posttest Mean Time (in Seconds) and Standard Deviations for the TUG an OLS

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Pretest:</u>					
TUG Mean Time (in seconds)	12.91	15.38	16.15	10.58	9.51
TUG SD	3.22	4.57	4.49	2.44	1.38
OLS Mean Time (in seconds)	20.59	17.98	16.41	24.98	23.00
OLS SD	6.69	6.99	6.71	5.91	7.15
<u>After 6 wks:</u>					
TUG Mean Time (in seconds)	11.25	13.60	11.59	9.65	10.14
TUG SD	2.57	3.17	3.27	1.55	2.27
OLS Mean Time (in seconds)	22.56	19.04	20.59	26.17	24.42
OLS SD	6.84	7.64	7.26	6.14	6.31

Figure 5. TUG Pretest and Posttest Mean Times for all Groups

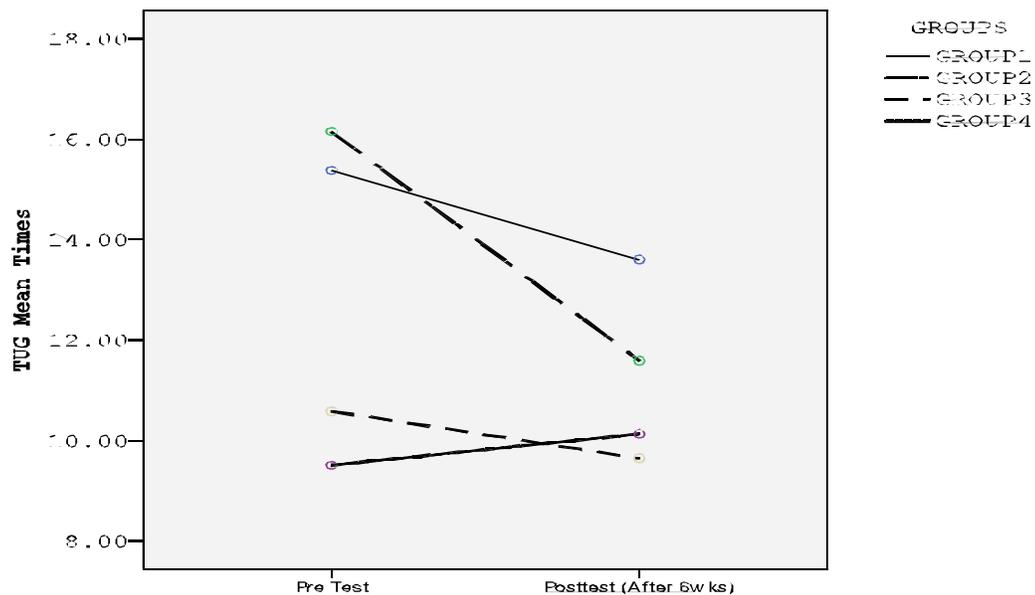


Figure 5 shows a graph that compares the TUG mean times pretest and posttest amongst the groups. A paired samples t-test was done for each group where the pretest and posttest mean times for the TUG served as the basis for comparison. Table 27 depicts the paired samples t-test for the TUG amongst the four groups.

Table 27. Paired Samples t-test for the TUG

Paired Differences						
Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig (2-tailed)
1	1.78	4.28	.639	3.46	44	.001*
2	4.57	4.21	.621	2.78	45	.008*
3	.938	2.64	.381	7.36	47	.001*
4	-.622	2.37	.353	-1.76	44	.085

*significant difference at $p < .05$

Results from Table 28 depict that Groups 1 ($t[44] = 3.46, p = .001$), 2 ($t[45] = 2.78, p = .008$), and 3 ($t[47] = 7.36, p = .001$) had significant differences in mean times pretest and posttest for the TUG. Group 4 ($t[44] = -1.76, p = .085$) did not have a significant difference in mean times pretest and posttest for the TUG.

An analysis of covariance (ANCOVA) was performed to covary the pretest mean times. ANCOVA results for the TUG are depicted in Table 28.

Table 28. ANCOVA for the TUG

Source	SS	df	Mean Square	F	Sig.	η^2
TUG PRE	184.48	1	184.48	30.70	.01	.15
GROUPS	166.55	3	55.52	9.24	.01	.14
Error						
Corrected	1075.65	179	6.01			
Total	1693.30	183				

Preliminary comparisons revealed that the pretest scores had a significant impact (adjustment) on the posttest TUG times ($TUG-Pre: F[1, 178] = 30.70, p = .001$). Table 29 presents obtained and adjusted means for the TUG. More importantly, the ANCOVA on the adjusted TUG posttest times was statistically significant ($F[3, 178] = 9.24, p = .001$). The obtained effect for TUG posttest times represented a large effect size (partial eta squared, $\eta^2 = .15$).

Table 29. Posttest Mean Times for Unadjusted and Adjusted TUG Values Among the Four Groups

Group	Unadjusted (Observed) Mean	Adjusted (Covaried) Mean
1	13.38	12.88
2	11.59	10.20
3	9.65	10.32
4	10.14	11.05

Post hoc testing showed that Group 1 had the highest adjusted posttest times on TUG (Table 30). Group 1 obtained significantly higher adjusted posttest scores than all three of the other groups (all p 's = .03 or smaller). Furthermore, there were no significant differences among the other three groups (all p 's > .05).

Table 30. Post hoc testing for the TUG Post Time Scores

GROUP	GROUPS	Mean Diff.	Std. Error	Sig.	95% CI	
					Lower	Upper
GROUP1	GROUP2	2.238*	.516	.000	.862	3.613
	GROUP3	2.562*	.567	.000	1.049	4.076
	GROUP4	1.764*	.601	.023	.160	3.368
GROUP2	GROUP1	-2.238*	.516	.000	-3.613	-.862
	GROUP3	.325	.584	1.000	-1.233	1.882
	GROUP4	-.474	.621	1.000	-2.130	1.182
GROUP3	GROUP1	-2.562*	.567	.000	-4.076	-1.049
	GROUP2	-.325	.584	1.000	-1.882	1.233
	GROUP4	-.799	.512	.722	-2.164	.567
GROUP4	GROUP1	-1.764*	.601	.023	-3.368	-.160
	GROUP2	.474	.621	1.000	-1.182	2.130
	GROUP3	.799	.512	.722	-.567	2.164

*The mean difference is significant at the .05 level

Figure 6. OLS Pretest and Posttest Mean Times for all Groups

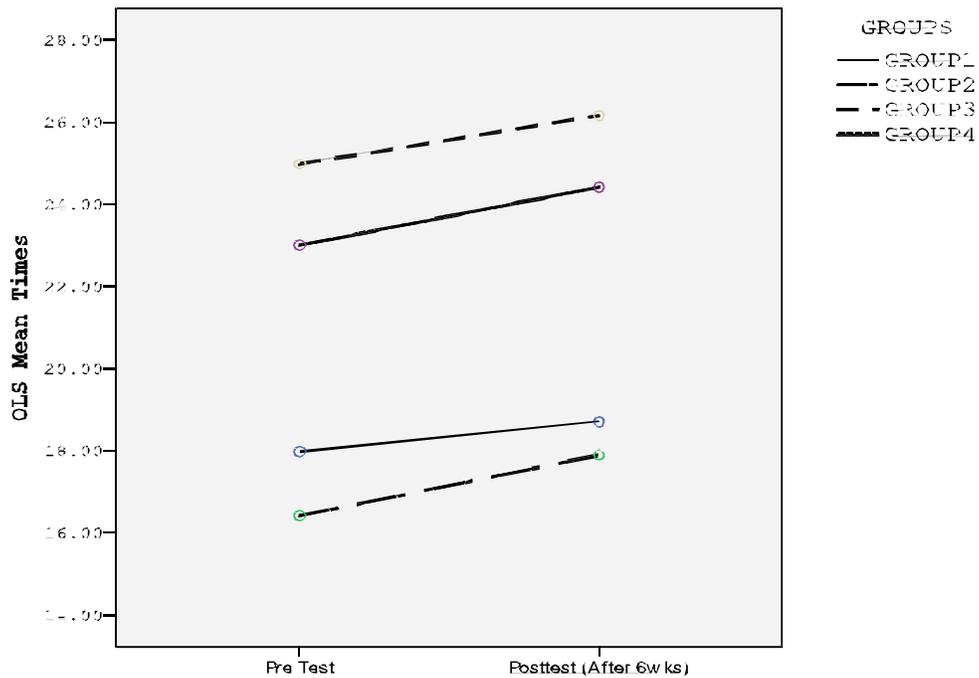


Figure 6 depicts a graph that compares the OLS mean times pretest and posttest amongst the groups. For the OLS, a paired samples t-test was done for each group where the pretest and posttest mean times served as the basis for comparison. Table 31 depicts the paired samples t-test for the OLS amongst the four groups.

Table 31. Paired Samples t-test for the OLS

Paired Differences						
Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig (2-tailed)
1	-.733	9.46	1.41	-.520	44	.606
2	-1.48	8.27	1.22	-1.21	45	.231
3	-1.19	8.50	1.23	-.968	47	.338
4	-1.42	10.07	1.50	-.947	44	.349

Results from Table 32 depict that the Groups did not have a significant difference in mean times pretest and posttest for the OLS (Group 1: $t[44] = -.520$, $p = .606$; Group 2: $t[45] = -1.21$, $p = .231$; Group 3: $t[47] = -.968$, $p = .338$; Group 4: $t[44] = -.947$, $p = .349$).

An analysis of covariance (ANCOVA) was performed to covary the pretest mean times. ANCOVA results for the OLS are depicted below in Table 32.

Table 32. ANCOVA for the OLS

Source	SS	df	Mean Square	F	Sig.	η^2
OLS PRE	59.19	1	59.19	1.30	.26	.01
GROUPS	1541.69	3	513.90	11.33	.01	.11
Error						
Corrected	8118.15	179	45.35			
Total	10533.74	183				

Preliminary comparisons revealed that the pretest times did not have a significant impact on the posttest times (OLS Pre: $F[1, 178] = 1.31, p = .26$). The lack of significance here is evident by how closely the unadjusted and adjusted means align and the ANCOVA made little adjustment to the posttest means (see Table 33). More importantly, the ANCOVA on the adjusted OLS posttest times was statistically significant ($F[3, 178] = 11.33, p = .01$). The obtained effect for OLS posttest times represented a medium-to-large effect size (partial eta squared, $\eta^2 = .11$).

Table 33. Posttest Mean Times for Unadjusted and Adjusted OLS Values Among the Four Groups

Group	Unadjusted (Observed) Mean	Adjusted (Covaried) Mean
1	19.04	19.12
2	20.59	20.79
3	26.17	25.92
4	24.42	24.31

Post hoc testing showed that Group 3 had the highest adjusted posttest times on OLS (see Table 34). Group 3 obtained significantly higher adjusted posttest times than Group 1 ($p = .001$) and Group 2 ($p = .001$). However, there was no significant difference between Group 3 and Group 4 ($p = .99$). Group 4 had the second highest adjusted posttest scores on OLS (see Table 35). Group 4 obtained

significantly higher posttest scores than Group 1 ($p = .003$) and 2 ($p = .001$). Lastly, there was no significant difference between Group 2 and Group 1 ($p = .99$).

Table 34. Post hoc testing for the OLS Post Time Scores

GROUP	GROUPS	Mean Diff.	Std. Error	Sig.	95% CI	
					Lower	Upper
GROUP1	GROUP2	.686	1.417	1.000	-3.094	4.466
	GROUP3	-6.856*	1.493	.000	-10.838	-2.873
	GROUP4	-5.281*	1.469	.003	-9.200	-1.362
GROUP2	GROUP1	-.686	1.417	1.000	-4.466	3.094
	GROUP3	-7.541*	1.531	.000	-11.626	-3.457
	GROUP4	-5.967*	1.496	.001	-9.958	-1.976
GROUP3	GROUP1	6.856*	1.493	.000	2.873	10.838
	GROUP2	7.541*	1.531	.000	3.457	11.626
	GROUP4	1.575	1.405	1.000	-2.174	5.324
GROUP4	GROUP1	5.281*	1.469	.003	1.362	9.200
	GROUP2	5.967*	1.496	.001	1.976	9.958
	GROUP3	-1.575	1.405	1.000	-5.324	2.174

*The mean difference is significant at the .05 level

Results for RH6

RH6. There will be significant increases in participant's perceived duration and intensity of exercise levels assessed from before to after the study for Groups 2 and 3. There will be no significant differences in Groups 1 and 4.

Perceived duration and intensity of exercise levels data was collected by using the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). Simple mean and standard deviation comparisons among the pretest and posttest scores are depicted in Table 35.

Table 35. Pretest and Posttest Mean Scores and Standard Deviations for the LTEQ

	OVERALL	GROUP 1	GROUP 2	GROUP 3	GROUP 4
<u>Pretest:</u>					
LTEQ Mean Score	64.40	18.64	15.70	24.72	21.69
SD	13.33	13.82	13.75	8.63	9.87
<u>After 6 wks:</u>					
LTEQ Mean Score	73.52	22.91	24.13	30.04	20.96
SD	12.47	10.19	10.04	11.37	9.36

Figure 7. LTEQ Pretest and Posttest Mean Times for all Groups

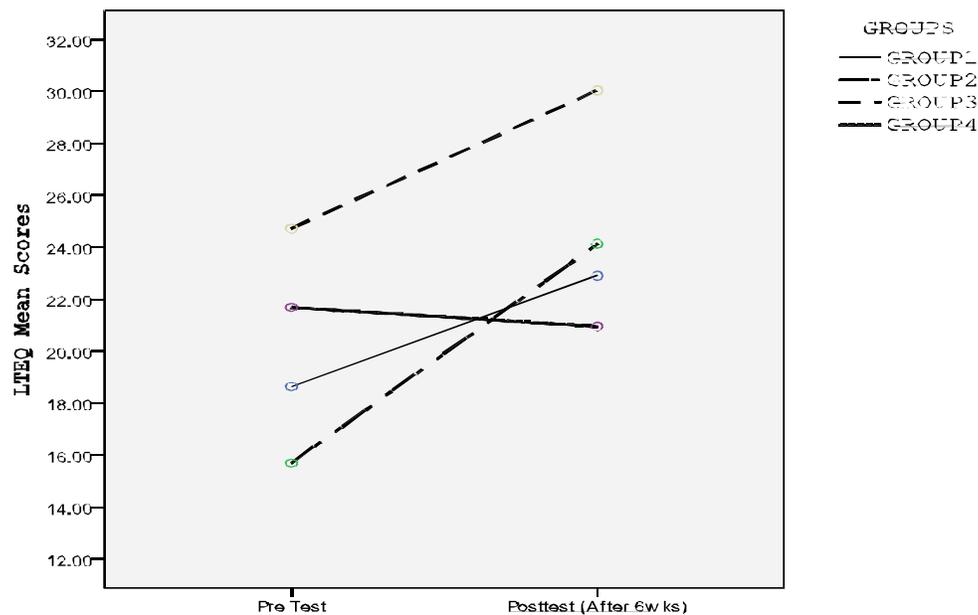


Figure 7 depicts a graph that compares the LTEQ mean scores pretest and posttest amongst the groups. A paired samples t-test was done for each group where the pretest and posttest scores for the LTEQ served as the basis for comparison. Table 36 depicts the paired samples t-test for the EII amongst the four groups.

Table 36. Paired Samples t-test for the LTEQ

Paired Differences						
Group	Mean	Std. Deviation	Std. Error Mean	t	df	Sig (2-tailed)
1	-4.27	14.34	2.14	-2.00	44	.052
2	-8.43	13.54	2.00	-4.23	45	.001*
3	-5.31	13.22	1.91	-2.78	47	.008*
4	.733	13.26	1.98	.371	44	.712

*significant difference at $p < .05$

Results from Table 23 depict that Groups 2 ($t[45] = -4.23$, $p = .001$) and 3 ($t[47] = -2.78$, $p = .008$) had a significant difference in mean scores pretest and posttest for the LTEQ. Groups 1 ($t[44] = -2.00$, $p = .052$) and 4 ($t[44] = .371$, $p = .712$) did not have a significant difference in mean scores pretest and posttest for the LTEQ.

An analysis of covariance (ANCOVA) was performed to covary the pretest scores. ANCOVA results for the LTEQ are depicted below in Table 37.

Table 37. ANCOVA for the LTEQ

Source	SS	df	Mean Square	F	Sig.	η^2
LTEQ PRE	1111.42	1	1111.42	11.10	.01	.06
GROUPS	1744.98	3	581.66	5.81	.01	.09
Error						
Corrected	17921.27	179	100.12			
Total	21190.24	183				

Preliminary comparisons revealed that the pretest scores had a significant impact (adjustment) on the posttest scores (LTEQ-Pre: $F[1, 178] = 11.10, p = .01$). More importantly, the ANCOVA on the adjusted LTEQ posttest scores was statistically significant ($F[3, 178] = 5.81, p = .01$). The obtained effect for LTEQ posttest mean scores represented a medium-to-large effect size (i.e., partial eta squared, $\eta^2 = .09$) because it fell between Murphy and Myers' (2004) ranges for medium (.06) and large (.14) effect sizes. The unadjusted and adjusted mean scores for the LTEQ are depicted in Table 38.

Table 38. Posttest Means for Unadjusted and Adjusted LTEQ Values Among the Four Groups

Group	Unadjusted (Observed) Mean	Adjusted (Covaried) Mean
1	22.91	23.32
2	24.13	25.06
3	30.04	29.27
4	21.96	20.33

Post hoc testing revealed that Group 3 had the highest adjusted posttest scores on LTEQ. Group 3 obtained significantly higher adjusted posttest scores than Group 4 ($p = .001$) and Group 1 ($p = .04$). However, none of the other post hoc comparisons were statistically significant. Table 39 displays the post hoc results for the LTEQ.

Table 39. Post hoc testing for the LTEQ Post Mean Scores

GROUP	GROUPS	Mean Diff.	Std. Error	Sig.	95% CI	
					Lower	Upper
GROUP1	GROUP2	-1.845	2.106	1.000	-7.464	3.774
	GROUP3	-5.840*	2.112	.038	-11.474	-.205
	GROUP4	2.601	2.118	1.000	-3.050	8.253
GROUP2	GROUP1	1.845	2.106	1.000	-3.774	7.464
	GROUP3	-3.995	2.143	.384	-9.712	1.723
	GROUP4	4.446	2.132	.231	-1.242	10.135
GROUP3	GROUP1	5.840*	2.112	.038	.205	11.474
	GROUP2	3.995	2.143	.384	-1.723	9.712
	GROUP4	8.441*	2.085	.000	2.878	14.004
GROUP4	GROUP1	-2.601	2.118	1.000	-8.253	3.050
	GROUP2	-4.446	2.132	.231	-10.135	1.242
	GROUP3	-8.441*	2.085	.000	-14.004	-2.878

*The mean difference is significant at the .05 level

Discussion for Research Hypotheses

RH1. Results from the 1QFOF from all the participants revealed a decline in FOF rates from 49.5% ($n = 91$) to 37.6% ($n = 50$) after six weeks. During the pretest, Groups 1 ($n = 45$) and 2 ($n = 46$) reported that they had an FOF and Groups 3 and 4 said that they did not. After the six-week intervention, the same 1QFOF was asked of all the

participants. Thirteen percent ($n = 6$) of the participants in Group 1 and 78% ($n = 36$) in Group 2 said that they no longer had an FOF. A paired samples t-test confirmed that Groups 1 ($p = .13$) and 2 ($p = .01$) had a significant difference in response. Results support the research hypothesis, noting that the usage of the GREI CD (Group 2) for six weeks significantly reduced FOF.

Along with the significant reduction in FOF for Group 2, two interesting notes were worth pointing out. The first is that along with Group 2, Group 1 (listened to a relaxation CD and music of their choice) had a significant reduction in FOF. Although the reduction was not as large as in Group 2, it is worthy to note that guided relaxation (e.g., deep breathing, PMR) along with music of choice might have effects on reducing FOF as well.

A second note worth explaining is the use of the 1QFOF. The 1QFOF has been used in many FOF research as a simple, straightforward, and useful tool to assess if older adults have an FOF (Legters, 2002). Using the 1QFOF in the study, the author felt that the assessment was too simple. A simple 'yes' and 'no' might discriminate if the participant had an FOF, but it was difficult to tell if the participant still had an FOF at the posttest but maybe to a lesser degree. Future studies measuring FOF might use intensity

as a hierarchy of responses (e.g., not afraid at all, slightly afraid, somewhat afraid, very afraid) to better reflect the intensity of the fear (Arfken et al., 1994; Lawrence et al., 1998; McAuley et al., 1997).

Lastly, Guided Relaxation and Imagery (GRI) has been proven to be an effective therapeutic tool in helping with smoking cessation (Wynd, 2005), improving the quality of life in cancer patients (Luebbert et al., 2001), reducing stress and anxiety for patients undergoing chemotherapy (Walker et al., 1999), reducing fear in dental treatment (Willumsen et al., 2001), reducing fear of flying (Wiederhold et al., 2002), and reducing fear of snakes (Hunt et al., 2006). Along with being a therapeutic tool in many research areas, this was the first study to reveal that guided relaxation and imagery might have an effect in reducing FOF. Specifically, the guided relaxation CD along with music of choice and the GREI CD had a significant impact in reducing FOF if used for six weeks.

RH2. Using the Short FES - I (Kempen et al., 2008) to measure self-efficacy levels, the author predicted that only Group 2 would have significantly higher self-efficacy scores from pretest to posttest. Results revealed that Groups 1, 2, and 3 all had a significant decrease (which meant higher self-efficacy) while Group 4 had a significant increase in scores.

The results for the Short FES - I (Kempen et al., 2008) revealed three interesting notions. First was that all groups showed a significant difference in scores and the overall mean posttest scores (mean score: 16.6, SD: 3.3) were relatively higher than the overall average score (mean score: 12.4, SD: 5.2) in a previous study that used the Short FES - I. Kempen and colleagues (2008) had 193 participants fill out the Short FES - I along with falls history and FOF rates. Table 40 depicts the mean scores according to fall history and FOF from their study.

Table 40. Mean Scores of the Short FES-I According to Falls History and Fear of Falling (Kempen et al., 2008)

Range	N	Short FES-I mean scores
Falls in previous year:		
0	113	11.5
1	56	12.5
>1	22	16.9
Fear of Falling:		
Not at all	54	8.0
A little	84	11.6
Quite a bit	34	16.5
Very Much	19	21.8
Total	193	12.4

When comparing the current post Short FES - I scores (Table 11) to Kempen et al.'s (2008) study, the overall average mean score (16.6) in this study was slightly lower than the average score (16.9) that was related to having more than one fall in the previous year. What was even more interesting was that the overall average score was slightly higher than the average score (16.5) that was related to having 'quite a bit' of FOF. Although the average mean posttest scores for Groups 3 (mean score: 13.1) and 4 (mean score: 14.4) were lower than the overall average in Kempen et al.'s study, the scores were still in the range of 'a little' to 'quite a bit' of FOF.

The second interesting notion is that Group 2 had the greatest significant drop in scores (from 23.7 to 20.36), but comparing the posttest mean score to Kempen et al.'s (2008) study, the score lies in between 'quite a bit' (mean score: 16.5) and 'very much' (mean score: 21.8) of FOF. This was interesting because during the posttest more than 78% of the participants in Group 2 reported that they no longer had an FOF, but according to Kempen et al., the mean score reveals that they still might have a high risk of falling and FOF. Group 1 had a lower average posttest score than Group 2 (Group 1 mean posttest score: 18.53), but their mean posttest score was also in between 'quite a bit' and 'very much' of FOF. This may mean that even though the scores for Groups 1 and 2 had significantly decreased, there still might be a chance that they have an FOF and a risk of falls. This point supports the need to change the 1QFOF to an intensity scale so it can provide a more in-depth analysis and comparison with the Short FES - I and the risk of falls and FOF.

Lastly, the third interesting notion was that in Group 4, there was a significant increase in mean scores from pretest (mean score: 13.0) to posttest (mean score: 14.4). Results might suggest that the guided relaxation and music of their choice might reduce falls related self-efficacy

levels for people who did not have an FOF in the beginning of the study. Overall, there are many confounding factors (e.g., race, age, sex, environment) that make a direct comparison from the current study to Kempen et al.'s (2008) difficult, but because the Short FES - I is relatively new, Kempen et al.'s study was the only basis for comparison. It will be interesting to see more studies in the future using the Short FES - I and how it compares to other FOF questionnaires.

RH3. The author predicted that GREI techniques will significantly improve confidence for Group 2 only. Confidence in doing daily activities without a fear of falling was measured by using the Activities Balance and Confidence Scale (ABC Scale; Powell & Myers, 1995). Results revealed some interesting findings. First was that Group 1 was the only group that had a significant increase in scores. This meant that guided relaxation along with music of choice had a significant effect in increasing confidence for participants who had an FOF at the beginning of the study. It was interesting to see that the relaxation CD along with music of choice had an effect on increasing confidence while the GREI CD did not have an effect for individuals who had FOF. It was interesting because the imagery scripts in the GREI CD were based on

the Activities of Daily Living (ADL) and the ABC Scale. For example, in track #7 of the GREI CD, it has a section where it talks about reaching for a small can off a shelf at eye level. This task was similar to question #4 on the ABC scale. Due to these similar examples taken from the ABC scale, the author predicted that Group 2 would have the most improvement but found out that it had no effect in changing the ABC scores among participants.

According to Lajoie and Gallagher (2004), a cut-off mark of < 67 in the ABC scale was established in order to allow the identification of older adults who present a substantial risk of falling in the future. Also according to Myers (1998), any score that is between 50 - 80 meant a moderate level of physical functioning. The post mean scores in each group (Group 1: 64.42, Group 2: 65.31, Group 3: 75.74, Group 4: 75.69), had moderate levels of physical functioning but, according to Lajoie and Gallagher, Groups 1 and 2 fall slightly in the falls risk category. This may suggest that even though there was significant improvement in scores of the ABC in Group 1, Groups 1 and 2 are still at risk for a fall in the future.

To the author's knowledge, there is no research done in creating ABC scale cut-off scores to predict FOF risks. Future investigation in this area is needed so the ABC scale can be used to better predict not only falling risks but FOF risks as well.

RH4. The author predicted that Groups 2 and 3 would have significantly higher exercise imagery rates. The use of exercise imagery was measured using the EII (Giacobbi et al., 2005). Results revealed that Groups 1, 2, and 3 had significant increases in their scores after the six week intervention. Group 4 did not have any significant change in scores. Using ANCOVA (pretest scores as covariates), Group 3 had the largest difference in average scores (Pre: 68.0, Post: 83.2) followed by Group 2 (Pre: 60.2, Post: 74.67).

To the author's knowledge, this study was the first to use EII specifically for older adults aged 60 and above. This was also the first study to use EII in an intervention study. Therefore, there was no basis of comparison of scores for previous studies. However, it was interesting to note that the groups who were given the GREI CD had a significant increase in their exercise imagery use. It was also interesting to find that Group 1 had a significant increase as well. This might suggest that, along with

listening to the GREI CD, guided relaxation and music of choice might also have an effect in increasing exercise imagery rates. It will be interesting in future studies to break down the EII scores into subscales (e.g., technique, appearance, health imagery) and examine what kinds of imagery participants used the most and what kind of exercise imagery improved the most by using the GREI CD. It will also be interesting to compare the scores of the subscales by FOF rates, falling rates, gender, age, race, and exercise levels to examine if exercise imagery actually has a difference or effect in any of these components.

RH5. The author hypothesized that there will be a significant difference of time (seconds) in the mobility tests assessed from before and after the study for Group 2 and no significant difference for Groups 1, 3, and 4. Two mobility tests, the Timed Up and Go (TUG; Podsiadlo & Richardson, 1991; Shumway-Cook, et al., 2000) and the One Leg Stance (OLS; Berg et al., 1989) were used as the mobility tests. The overall mean time (in seconds) decreased from 12.91 to 11.25. From a paired samples t-test, results revealed that Groups 1, 2, and 3 had significant decreases of mean times (in seconds) while Group 4 had no significant difference. Group 2 showed the biggest decrease of mean time (in seconds) from 16.15 to

11.59. Comparing the TUG results to previous studies, the overall post mean time (11.25 seconds) was lower than a study done by Newton (2001) that measured the TUG with 254 participants (mean age: 74.1, SD: 7.90). The average mean time in Newton's study was 15.6 seconds. In a more recent study, Herman, Inbar-Borovsky, Brozgol, Giladi, and Hausdorff (2009) administered the TUG to 278 (mean age: 76.3, SD: 4.60) healthy older adults and the average time was 9.5 seconds. The creators of the TUG, Podsiadlo and Richardson (1991), interpret that any time below or equal to 10 seconds is normal. Any time between 10 to 20 seconds is interpreted as good mobility, can go out alone, and mobile without an aid. Any time from 20 to 30 seconds is interpreted as having problems, cannot go outside alone, and requires a gait aid. Shumway-Cook et al. (2000) interpreted that any time that is more than or equal to 14 seconds is an indication of high risk of falls. Another interpretation is that the more time taken in the TUG, the more dependent in ADLs (Shumway-Cook et al., 2000). Whitney, Lord, and Close (2005) explored how the TUG could be used in association with the Physiological Profile Assessment (PPA) as a means of identifying low to high fall risk patients. Results from Whitney et al.'s study showed that 15 seconds for the TUG was found to be an optimal cut-

point between low and high falls risk in their study of 110 participants. In the current study, it was interesting to find that Groups 1 and 2 had higher average times (Group 1: 15.38 seconds, Group 2: 16.15 seconds) than Sumway-Cook et al.'s (2000) and Whitney et al.'s (2005) cutoff score of 14 seconds or higher. However, after the six week intervention, both groups had lower times (Group 1: 13.60 seconds, Group 2: 11.59 seconds) than the high risk falls cutoff time, indicating that using the guided relaxation CD with a music of choice or the GREI CD might have significant effects of changing participants from high risk to low risk of falls. Another interesting finding is that Group 3, who did not have an FOF in the beginning of the study, showed a significant drop of time in the TUG test. Overall, results reveal that the GREI CD helped lower times in the TUG for older adults who did and did not have an FOF. The relaxation CD and music of choice also showed effects of reducing times in the TUG test for older adults who have an FOF but showed no effect for older adults who did not have an FOF.

As for the OLS or the Single Leg Stance (SLS), results revealed that none of the groups had any significant difference from pretest to posttest. This was interesting as both the TUG and OLS are highly correlated with each

other in balance and falling research (Kinugasa, Nagasaki, Furuna, & Itoh, 1996; Ringsberg et al., 1998). A few ideas regarding the results for the OLS are explained below.

First, the maximum time allowed for testing was 30 seconds. This meant that even though some participants exceeded the maximum 30 seconds during the posttest, only 30 seconds were recorded. This may have caused an effect that could have resulted in the under and over estimation of the average performances.

Second, although the results were not significant, all the groups improved in times from pretest to posttest. According to a meta-analysis in SLS times by Bohannon (2006), the pretest average times (range: 16.41 - 24.98) and the posttest average times (range: 19.04 - 26.17 seconds) in the current study were higher than the average time for 22 studies (N = 3484, Range age: 60 - 99) which was 15.7 seconds. Comparisons show that all the participants in the current study had better SLS times in their pretest than previous studies. Bohannon also explained that the standard for 60 to 69 year olds was 20.4 seconds, 70 to 79 year olds 11.4 seconds, and 80 to 99 year olds 1.0 second. All the participants in this study started higher than the standards above, perhaps revealing that the balance levels were high at the beginning of the

study. This may indicate that the participants already had a high level of balance in the beginning of the study and it was difficult for the participants to improve on their times because of the 30 second cutoff.

Lastly, another assumption as to why there was not a significant difference in all groups came from an observation made while testing the OLS. Some participants were inconsistent during their practice and actual testing. Each participant was given as many practice trials as needed. Some participants could balance on one leg for a maximum of 30 seconds during practice but maybe falter during testing. This might have caused skewness of the data. Also, some participants who had good pretest times might have accidentally lost their balance or touched their foot on the floor, which led to a stoppage of their time. These factors may have skewed the data to reveal no significant difference in times.

RH6. The Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985) is a simple, valid, and reliable tool that assesses perceived physical activity levels (Kriska & Casperson, 1997). Results from the study revealed that Groups 2 (pretest MET score: 15.70, posttest MET score: 24.13) and 3 (pretest: 24.72, posttest: 30.04) had a significant increase in total MET scores after the

intervention. Groups 1 (pretest: 18.64, posttest: 22.91) and 4 (pretest: 21.69, posttest: 20.96) did not have any significant difference in total MET scores. All the groups had an increase of scores from pretest to posttest except for Group 4. It was interesting to find that Group 4 (No FOF - Placebo Control Group) had lower perceived posttest exercise levels and lower levels than Groups 1 and 2. This might suggest that perceived exercise levels do not distinguish individuals who have or do not have an FOF. This might also suggest that guided relaxation and music of choice might decrease perceived exercise levels for individuals who do not have an FOF.

In regards to national exercise level standards, the CDC (2008b) recommends older adults aged 65 and above exercise at least 150 minutes at a moderate intensity level or 75 minutes at a vigorous intensity level each week for health benefits. If the CDC recommendations were incorporated into the LTEQ scoring system, older adults should score at least a 45 to maintain healthy benefits. In the current study, all the groups were below the score of 45. This may indicate that all the participants in this study were not exercising the recommended amount of exercise needed to get healthy benefits by the CDC.

According to Hansma, Emmelot-Vonk, and Verhaar (2009), one of the best ways to prevent FOF is to exercise. This study did not measure actual exercise levels, but it did examine perceived exercise levels. Results found that GREI had a significant effect in increasing perceived exercise levels. Although all the groups had lower MET scores than the recommended levels by the CDC (2008), the GREI CD did show an effect in increasing the MET score for groups who did and did not have an FOF. This is important to identify because one of the goals in this study was to examine if the GREI CD had motivating effects for individuals to exercise. Results reveal that guided relaxation and imagery has an effect in increasing perceived exercise levels and it is an important notion for future studies that want to build exercise programs or interventions for sedentary older adults. It will be interesting in future studies to use GREI techniques and examine if it has an effect in actual exercise levels (e.g., walking distance, time).

Lastly, two other studies that used the LTEQ with an older population were compared with this study. Wójcicki, White, and McAuley (2009) used the LTEQ with 320 (Mean age: 63.8) healthy older adults aged 50 and above. Results from Wójcicki et al.'s study revealed an average MET score of

42.52. Giacobbi (2007) assessed the LTEQ with 167 participants aged from 45 - 65 (Mean age: 48.75) and their average score was 35.99. From these studies, it shows that even healthy adults aged 45 and above had average scores underneath the CDC guideline. The results from the two studies might suggest that middle aged and older adults are not getting enough exercise or the CDC standards are too high. Although it is difficult to make general assumptions from these studies, more research is needed in this area to create a more suitable physical activity guideline for older adults or create interventions that would promote a more active lifestyle for sedentary older adults.

General Discussion

The main purpose of this study was to examine the effects of GREI with older adults who had an FOF. Table 41 presents the pretest, posttest mean scores/times and p-values for all the questionnaires and mobility tests in the four groups.

Table 41. Overall Pretest and Posttest Mean Scores/Times for all the Groups

	Group 1 [^]	Group 2 [^]	Group 3 [^]	Group 4 [^]
<u>FOF?</u>				
PRETEST				
Yes	45.00	46.00	0.00	0.00
No	0.00	0.00	48.00	45.00
POSTTEST				
Yes	39.00	10.00	1.00	0.00
No	6.00	36.00	47.00	45.00
SIG. (2-TAILED)	0.01*	0.01*	0.32	No change
<u>SHORT FES-I</u>				
PRE MS	20.62	23.69	14.72	13.02
POST MS	18.53	20.36	13.12	14.37
SIG. (2-TAILED)	0.01*	0.01*	0.02*	0.04*
<u>ABC SCALE</u>				
PRE MS	59.55	62.91	75.85	76.41
POST MS	64.42	65.31	75.74	75.69
SIG. (2-TAILED)	0.01*	0.08	0.92	0.51
<u>EII</u>				
PRE MS	58.53	60.15	68.00	70.93
POST MS	62.73	74.67	83.19	73.47
SIG. (2-TAILED)	0.02*	0.01*	0.01*	0.38
<u>TUG</u>				
PRE MS	15.38	16.15	10.58	9.51
POST MS	13.60	11.59	9.65	10.14
SIG. (2-TAILED)	0.01*	0.01*	0.01*	0.09
<u>OLS</u>				
PRE MS	17.98	16.41	24.98	23.00
POST MS	19.04	20.59	26.17	24.42
SIG. (2-TAILED)	0.61	0.23	0.34	0.35
<u>LTEQ</u>				
PRE MS	18.64	15.70	24.72	21.69
POST MS	22.91	24.13	30.04	20.96
SIG. (2-TAILED)	0.05	0.01*	0.01*	0.71

[^]Group 1: Fear of Falling (FOF) - Placebo Control Group (PCG),
 Group 2: FOF - Intervention Group (IG), Group 3: NoFOF - IG,
 Group 4: NoFOF - PCG

*Significant at $p < .05$

Overall, the GREI CD helped significantly lower FOF rates after a six-week intervention. More than 78% of the participants in Group 2 (participants who had an FOF during pretest) reported that that they no longer had an FOF after using the GREI CD. To a lesser degree, 20% of the participants in Group 1 also reported that they no longer had an FOF as well after listening to a guided relaxation CD and music of choice. Results suggest that both audio types had a significant impact in reducing FOF among the elderly, while the GREI CD had greater effects in reducing FOF than the guided relaxation CD and music of choice.

The current study supported previous Guided Relaxation and Imagery (GRI) research (Hunt et al., 2006; Luebbert et al., 2001; Walker et al., 1999; Wiederhold et al., 2002; Willumsen et al., 2001; Wynd, 2005) that GRI is an effective therapeutic tool for problem behaviors and issues. Previous FOF studies have used different interventions such as exercise only interventions (Brouwer, Walker, Rydahl, & Culham, 2003; Indiana University, 2009; Schoenfelder & Rubenstein, 2004; Wolf et al., 1996), education and exercise combined programs (Nitz & Choy, 2004; Tennstedt et al., 1998) and hip protectors (Cameron et al., 2000) to reduce FOF, but the advantage of GREI over other intervention tools is that it can be used by anyone without

any costs or physical skill required. GREI was specifically made so the older adult could be confident to do certain daily activities (e.g., go to bathroom, walking around supermarket) without having an FOF. It is also an important starting block, especially for those who are unable to do certain physical activities simply because they are fearful that they might fall. The main goal was to examine if GREI will help decrease FOF rates. Since it does significantly reduce FOF, the goal now is to examine if GREI will completely erase FOF and prevent FOF from happening again in the future.

Another goal of this study was to increase falls self-efficacy, balance confidence, exercise imagery levels, perceived exercise levels, and better times in two mobility tests by using the GREI CD. Results revealed that groups who used the GREI CD (Groups 2 and 3) had significant increases in falls self-efficacy, exercise imagery rates, perceived exercise levels, and a significant improvement in a mobility test (e.g., TUG). This might suggest that listening to the GREI CD is a good way to increase scores in falls efficacy and exercise imagery questionnaires, perceived exercise levels, and a mobility test for older adults who do and do not have an FOF. However, it does not have any effect in increasing balance confidence or a

mobility test that requires balance (e.g., OLS, SLS). Interestingly, guided relaxation along with music of choice also had significant improvements in falls self-efficacy, balance confidence, exercise imagery rates, and a significant improvement in a mobility test (e.g., TUG) for adults who had an FOF. This might suggest that if the GREI CD is not available, older adults who have an FOF might benefit from this alternative tool to reduce FOF, increase scores in falls efficacy, balance and exercise imagery questionnaires, perceived exercise levels, and a mobility test. However, older adults who do not have an FOF might not have benefit at all from using this tool.

In conclusion, it has been shown that GREI does have effects in reducing FOF. More research is needed to find ways to apply this helpful and valuable tool that anyone has the power to do on their own. GREI is a free, simple, therapeutic, and effective tool that can be used by older adults to help with their FOF, anytime of the day, anywhere they go. With a little bit of guidance and education from researchers, educators, care providers, and health practitioners, GREI will hopefully be used by many older adults for their benefits and be passed along to friends, family, and others for future long term use.

Implications for Researchers

This study was the first to examine the effects of using guided relaxation and exercise imagery to help lower FOF rates among community dwelling adults aged 60 and above. Based upon the limitations and findings, a few suggestions are noted to researchers interested in this field.

The first concern was the recruitment of participants. This was the most difficult part of the study. Although there were enough participants recruited for the purposes of this study, it was very challenging at times to recruit these participants. The author had to locate and contact senior centers, churches, and senior organizations for their permission to recruit participants. Many places did not respond to the author's request and some places did not want their members to participate in the study. Many researchers have a hard time recruiting participants. The author's recommendation to these problems is to be personable and persistent. The author found that many senior centers were better reached through phone than email. A simple request to meet with the coordinator or director of a senior center or church also helped ease the recruitment. When meeting with the coordinator or director, it is helpful to give a brief explanation of the study, provide examples of materials and assessments that will be

used in the study, and ask them if they could possibly advertise the study through flyers or announcements. It was also found helpful to follow up with an email or phone call thanking them for their help.

When meeting with potential participants who are older than 60, it is important to gain their trust and develop rapport. Many participants were at first shy and did not want to admit their FOF. However, by explaining the study and how common and serious FOF was among older adults, many participants opened up and were more willing to participate. It is very important to treat each individual as unique and take the time to sit down, listen to their stories, problems, and feedback. What the author learned most through this study was the need for more personal relationships among the elderly. The author felt that sometimes participants were simply lonely and needed someone to talk to, especially about their FOF. Getting to know participant names and checking up on them regularly is also important when recruiting older participants. Another concern is the duration of filling out the questionnaires and mobility tests during the pretest and posttest. The older the participants are, the shorter their patience. Therefore, it is essential to choose the right questionnaires not only for the study, but also to take

into account that the duration of the pretest or posttest is not too long to make the participant distracted or agitated. For this study, a questionnaire had to be changed to a shorter version (e.g., from a FES-I to a Short FES-I) after complaints from the pilot study reporting that the questionnaire was too long. It is important for researchers studying older adults to make their explanations, assessments, questions, and answers as clear as possible and as short as possible.

For future researchers interested in using guided exercise imagery, it is recommended to make the guided imagery as unique and personable as possible to each participant. The author noticed that some participants in this study did not enjoy listening to the GREI CD simply because it did not relate to their lives. According to Kim and Giacobbbi's (2009) study in exercise imagery among middle aged adults, creating an image that closely relates to that certain individual is most effective in enhancing their imagery experience. The GREI CD was created through general concepts and ideas in the research of FOF and exercise imagery. Researchers should try to focus on making an imagery guide more personable to make each individual's imagery experience unique and motivating.

Implications for Practitioners

In the area of FOF research, the greatest efforts have been devoted to developing methods to treat and reduce FOF. Less attention has been given to how FOF occurs, especially factors that are intrinsic to the person such as health, fitness, and psychological aspects such as depression and anxiety. It is important for practitioners not only to treat and reduce FOF but to try to take extra measures to prevent the initial stage of FOF. A study done by Friedman et al. (2002) investigated if FOF was an independent predictor for falls and vice versa. Results showed that FOF and falls were both risk factors for one another. Specifically, Friedman et al. concluded that falls and FOF are common and serious conditions that may set off "vicious cycles" of many detrimental outcomes such as functional decline, decrease of quality of life, depression, and institutionalization. Health practitioners must take into account the "vicious cycle" falls and FOF may lead to and must take every measure to educate, help, and provide older adults ways and solutions to prevent falling and FOF.

Many practitioners working with individuals who have an FOF view FOF as an illness (Haslam & Stubbs, 2004). Recently, the focus of FOF prevention among older people has been narrower than desirable. Although there have been

several medical studies and research that address the serious problem of FOF, more attention is still needed in preventing FOF. Medical practitioners and researchers should not put their medical assessments and treatments primarily focused on healing and avoiding reoccurrence in FOF, but on identifying and preventing FOF before it may lead to detrimental falls. If practitioners are able to identify precursors to FOF, it will help not only to reduce FOF but also falling rates among older adults. Sharaf and Ibrahim (2008) identified physical and psychosocial correlations of FOF among older adults in assisted living facilities. They found that the use of a walking device, depression, balance impairment, trait anxiety, female gender, and a previous history of a fall or falls were all independent factors associated with fear of falling. According to Sharaf and Ibrahim, they suggest that improving physical fitness and balance control and increasing one's self-efficacy and sense of control over the environment may decrease FOF among older adults.

FOF needs to be assessed by health care providers and practitioners as they work with older adults (Legters, 2002). FOF should be viewed separately from falling and we need to especially educate those who have not fallen. As shown in this study, the GREI CD helped increase self-

efficacy, mobility tests, and perceived exercise levels among individuals who did not have an FOF. Practitioners and health care providers should use the GREI CD as an educational tool, a starting block for individuals who do and who do not have an FOF. Hopefully, by providing a GREI CD or teaching older adults how to use imagery, these individuals will use imagery on their own whenever they need the motivation or confidence to lower their FOF or increase their exercise levels. More research is needed to find different ways to offer GREI techniques to older adults, such as the internet, newspaper, mp3 file, or magazines.

Also, health practitioners and researchers should find more ways to stimulate images that will not only decrease FOF rates but also stimulate the mind to healthier outcomes associated with imagery. Qualified practitioners could also help older adults write imagery scripts that focus on their target behaviors such as decreasing FOF or increasing their exercise levels. For those who favor a less structured approach, practitioners might be able to develop a list of cue words or triggers that stimulate specific images and apply such triggers during specific times throughout the day (Giacobbi, 2007).

The ultimate goal is for older adults to use GREI techniques as a tool to not only help decrease FOF but, ideally, prevent it.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Summary

The main purpose of this study was to examine the effects of a six-week intervention that used Guided Relaxation and Exercise Imagery (GREI) techniques on lowering Fear of Falling (FOF) rates among community dwelling adults aged 60 and above. A secondary purpose was to study the effects of GREI techniques on self-efficacy, self-confidence, exercise imagery use, perceived exercise levels, and specific simple mobility tests.

A total of 184 participants (See Chapter 4 for detailed demographics) were included in this study. Each participant was selectively and randomly placed in one of four groups according to their FOF (e.g., if 'yes' to FOF then randomly put in either Groups 1 or 2. If 'no' to FOF then randomly put in either Groups 3 or 4): (1) fear of falling placebo control group (FOF - PCG), (2) fear of falling intervention group (FOF - IG), (3) no fear of falling intervention group (No FOF - IG), and (4) no fear of falling placebo control group (No FOF - PCG). Participants met with the researcher two times to conduct

pretests and posttests. During pretest, participants completed a demographics/screening form, Exercise Imagery Inventory (EII; Giacobbi et al., 2005; Appendix C), Activities-specific Balance and Confidence (ABC) Scale (Powell & Myers, 1995; Appendix D), Short Falls Efficacy Scale-International (Short FES-I; Kempen et al., 2008; Appendix E), and the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985; Appendix F). After the four questionnaires, two mobility tests were administered: the TUG (Podsiadlo & Richardson, 1991; Shumway-Cook et al., 2000) and the OLS (Berg et al., 1989).

After the pretest, participants were given either a GREI audio CD created by the researcher or a placebo audio CD that included two relaxation tracks. If participants were placed in Groups 1 and 4, they were the Placebo Control Group (PCG). In the PCG, participants were given a placebo audio CD that consisted of one introductory track and two guided relaxation tracks. They were also instructed to listen to music of their choice for five minutes after listening to the relaxation track. Participants listened to the relaxation track and songs of their choice for six weeks, two times a week (day of their choice but had to be consistent days throughout the six weeks), and for 10 minutes a session (time of their choice

but had to be consistent times throughout the six weeks). They were also given an instruction booklet (Appendix G) and a checklist (Appendix H) to monitor their progress during the six weeks.

Participants in Groups 2 and 3 were the intervention groups. For these groups, the same procedures were used as in the placebo control groups but, instead of a placebo audio CD, participants were given a GREI CD created by the researcher. This CD consisted of one introduction track, two guided relaxation tracks, and 12 guided imagery tracks. After six weeks, the researcher met with all of the participants and administered the same instruments that were given in the pretest.

Through simple paired t-test and ANCOVA analysis, results revealed that the GREI CD had significant effects in reducing FOF (78%), and significantly increasing exercise imagery rates, efficacy in falls related activities, and perceived exercise levels. The GREI CD also had effects in significantly reducing time in a simple mobility test (e.g., TUG). There was also a significant reduction in FOF (20%) and significant increases in exercise imagery rates, efficacy in falls related activities, confidence in balance, exercise imagery rates, and a mobility test (e.g., TUG) for participants who had an

FOF pretest and received a placebo audio CD. However, participants who received the placebo audio CD and did not have an FOF during the pretest did not have significant differences in any of the tests except for a significant decrease in falls efficacy.

Overall, this study revealed that using a GREI CD for six weeks helped decrease levels of FOF for older adults aged 60 and above. GREI was also effective in increasing falls related efficacy, exercise imagery, and perceived exercise levels. Previous interventions have been successful in lowering FOF (Jung et al., 2009) but the advantage of GREI over other intervention tools is that it can be used for long term use, anywhere, anytime, and without any costs or physical skills required. A future recommendation for researchers and practitioners is to educate and motivate older adults who have an FOF to use relaxation and imagery for their benefit. Hopefully by teaching older adults how to use relaxation and imagery, not only will their FOF levels decrease and but it will also lead to other beneficial effects such as lower falling rates, higher quality of life, confidence, and motivation to do activities or physical skills without having any fear.

Conclusions

The following conclusions were made according to the findings from the current study. Each conclusion was derived from research hypotheses 1 through 6, respectively.

1. Listening to the GREI CD for 10 minutes, two times a week for six weeks, resulted in a significant decrease in FOF rates among community dwelling older adults. Listening to a guided relaxation CD along with music of choice for 10 minutes, two times a week for six weeks, also resulted in a significant FOF decrease among older adults.

2. Listening to the GREI CD for 10 minutes, two times a week for six weeks, resulted in a significant increase in fall-related self-efficacy among community dwelling older adults who had and did not have an FOF prior to the study (Groups 2 and 3). Listening to a guided relaxation CD along with music of choice for 10 minutes, two times a week for six weeks, also resulted in a significant increase in fall-related self-efficacy among community dwelling older adults who had FOF prior to the study (Group 1). The guided relaxation CD along with music of choice for the participants who did not have an FOF prior to the study resulted in a significant decrease in fall-related self-efficacy after the six week intervention (Group 4).

3. Listening to the GREI CD for 10 minutes, two times a week for six weeks, resulted in no significant change in confidence to avoid falling while performing everyday activities (e.g., cleaning the house, getting dressed) for community dwelling older adults who had and did not have an FOF prior to the study (Groups 2 and 3). Listening to a guided relaxation CD along with music of choice for 10 minutes, two times a week for six weeks, resulted in no significant change for community dwelling older adults who did not have an FOF prior to the study (Group 4) but it did significantly increase confidence for older adults who had an FOF prior to the study (Group 1).

4. Listening to the GREI CD for 10 minutes, two times a week for six weeks, resulted in a significant increase in exercise imagery rates among community dwelling older adults who had and did not have an FOF prior to the study (Groups 2 and 3). Listening to a guided relaxation CD along with music of choice for 10 minutes, two times a week for six weeks, also resulted in a significant increase in exercise imagery rates among community dwelling older adults who had FOF prior to the study (Group 1) but no significant difference in exercise imagery rates for older adults who did not have an FOF (Group 4).

5. Listening to the GREI CD for 10 minutes, two times a week for six weeks, resulted in a significant improvement in time (seconds) for the Timed Up and Go (TUG; Podsiadlo & Richardson, 1991) for community dwelling older adults who had and did not have an FOF prior to the study (Groups 2 and 3). Listening to a guided relaxation CD along with music of choice for 10 minutes, two times a week for six weeks, also resulted in a significant improvement in time (seconds) for the TUG in community dwelling older adults who had FOF prior to the study (Group 1) but no significant difference in time for older adults who did not have an FOF (Group 4). The GREI CD and the relaxation CD along with music of choice did not have any effect in any of the groups for the One Leg Stance (OLS; Berg et al., 1989).

6. Listening to the GREI CD for 10 minutes, two times a week for six weeks, resulted in a significant increase in perceived exercise levels among community dwelling older adults who had and did not have an FOF prior to the study (Groups 2 and 3). Listening to a guided relaxation CD along with music of choice for 10 minutes, two times a week for six weeks, resulted in no significant difference in perceived exercise levels among community dwelling older adults who had and did not have FOF prior to the study (Groups 1 and 4).

Recommendations for Future Research

The following recommendations for future research are suggested by the limitations, results, and conclusions from the current study:

1. According to Legters (2002), more multidimensional studies are needed in FOF research. A future multidimensional study might be to use the similar GREI techniques along with mind body therapies such as tai-chi and yoga. Recently, mind body therapies such as tai-chi (Sattin et al., 2005) and yoga (Indiana University, 2009) have been shown to help reduce FOF rates among the elderly. It will be interesting if a future study had a group where they used both mind (e.g., GREI techniques) with body (e.g., yoga, tai-chi) therapies, one group that used either the mind or body therapy, and one group that was a control to find which method acted best in reducing FOF rates.

2. Another multidimensional intervention study that might be of interest is to use GREI techniques along with aquatic programs such as water aerobics and examine if the two combined will help lower FOF. Water based programs such as water aerobics have been used extensively in physical therapy and sport rehabilitation. Devereux, Robertson, and Briffa (2005) examined if a water based program had any effects on balance, fear of falling, and

quality of life in community-dwelling women 65 years of age or older with a diagnosis of osteopenia or osteoporosis. Results from this study concluded that water-based exercise and a self-management program produced significant changes in balance and quality of life, but not fear of falling. Because the current study showed that GREI techniques might reduce FOF, a follow-up to Devereux et al.'s study might be to use GREI techniques along with the water based program and examine if it will help lower FOF. It will be interesting if it will also help reduce FOF along with GREI techniques.

3. Researchers might want to examine the long term effects of GREI and FOF. Most of the research in FOF has been cross-sectional and therefore more longitudinal studies are needed (Jung et al., 2009; Legters, 2002). Although this six week study showed that the GREI CD had effects in decreasing time in a mobility test (e.g., TUG), FOF rates, and had effects in increasing self-efficacy, exercise imagery use, and perceived exercise levels, six weeks, is still a relatively short term intervention (Jung et al., 2009). It will be interesting to re-examine the same participants with the same questionnaires and mobility tests in three, six, nine, and 12 months to see if this study had any long term effects in decreasing the rates of

FOF. According to Jung et al.'s (2009) meta-analysis in FOF treatment programs, they suggest that best results are achieved four months after the beginning of the intervention program. It may be interesting if there are any greater effects in treating FOF if future researchers would create a longer version of the GREI CD. It would also be interesting to expand the intervention period for this study to four months and re-examine if the GREI CD will have effects in significantly improving the scores and times of the questionnaire (e.g., ABC Scale) and mobility test (e.g., OLS) that were not significant at six weeks.

4. Another future study is to examine the effects of GREI in falling rates. There were no comparisons made in this study for falling rates. Only during the pretest were participants asked their falling rates within the past month and three months. It will be interesting in a follow up study if falling rates decrease after the study has been completed. A more valid and accurate method is needed to monitor falling rates as participants' reports about falling might not be an accurate method.

5. Another follow up to this study is to compare the results for each questionnaire and mobility test by gender, age, and race. The purpose of the current study was to compare the results by Groups. In future studies, it will be interesting if there are any similarities or differences between gender, age, and race.

6. A more in-depth statistical analysis between FOF rates, EII, Short FES-I, ABC scale, LTEQ, TUG, and the OLS is needed to find any relationships, correlations, or predictions for future FOF research. Future research should especially focus on the EII and the Short FES-I in FOF and exercise imagery research because both of the questionnaires are relatively new and have never been used in an intervention study until now.

7. The current study had four groups listening to the GREI CD or a relaxation CD with a music of choice, 10 minutes a day, two times a week, for six weeks. It will be interesting in future studies if different variations of time (e.g., 12 week study or listening to GREI CD for five times a week) will have lesser, greater, or the same effects when compared to the time frame from the current study.

8. It will be interesting if GREI techniques can be used to promote other behaviors such as increasing confidence and exercise levels for obese children and teenagers.

REFERENCES

- Ajzen I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopedic Surgeons Panel on Falls Prevention. (2001). Guidelines for prevention of falls in older persons. *Journal of American Geriatrics Society*, 49, 664-672.
- American Society of Clinical Hypnosis. Definition of hypnosis. Retrieved from <http://asch.net/genpubinfo.htm> at February 18, 2008.
- Annett, J. (1994). The learning of motor skills: Sports science and ergonomics perspectives. *Ergonomics*, 37, 5-15.
- Arai, T., Obuchi, S., Inaba, Y., Nagasawa, H., Shiba, Y., Watanabe, S., Kimura, K., & Kojima, M. (2007). The effects of short-term exercise intervention on falls self-efficacy and the relationship between changes in physical function and falls self-efficacy in Japanese older people. *American Journal of Physical Medicine and Rehabilitation*, 86, 133-141.
- Arfken, C. L., Lach, H. W., Birge, S. J., & Miller, J. P. (1994). The prevalence and correlates of fear of falling in elderly persons living in the community. *American Journal of Public Health*, 84, 565-570.
- Armstrong, C. A., Sallis, J. F., Hovell, M. F., & Hofstetter, C. R. (1993). Stages of change, self-efficacy, and the adoption of vigorous exercise: A prospective analysis. *Journal of Sport and Exercise Psychology*, 15, 390-402.
- Baider, L., Uziely, B., & De-Nour, K. (1994). Progressive muscle relaxation and guided imagery in cancer patients. *General Hospital Psychiatry*, 16, 340-347.

- Baird, C. L., & Sands, L. P. (2006). Effect of guided imagery with relaxation on health-related quality of life in older women with osteoarthritis. *Research in Nursing and Health, 29*(5), 442-451.
- Bakker, F. C., Boschker, M. S. J., & Chung, T. (1996). Changes in muscular activity while imagining weight lifting using stimulus or response propositions. *Journal of Sport & Exercise Psychology, 18*, 313-324.
- Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1995). *Self-efficacy in changing societies*. New York: Cambridge University Press.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31*, 143-164.
- Barhameen, A. (2005). Predictive models for fear of falling among inner city minority community-dwelling older adults: Comparison between two instruments. Unpublished dissertation. Temple University, Philadelphia, PA.
- Barker, S. P., & Harvey, A. H. (1985). Falls injuries in the elderly. *Clinics in Geriatrics Medicine, 1*, 501-512.
- Barr, K., & Hall, C. (1992). The use of imagery by rowers. *International Journal of Sport Psychology, 23*, 243-261.
- Benson, H. (1975). *The relaxation response*. New York: William Morrow.
- Benson, H., Beary, J., & Carol, H. (1974). The relaxation response. *Psychiatry: Journal for the Study of Interpersonal Processes, 37*, 37-46.
- Berg, K., Wood-Dauphinnee, S., Williams, J. I., & Gayton, D. (1989). Measuring balance in the elderly: Preliminary development of an instrument. *Physiotherapy Canada, 41*, 304-311.

- Betts, G. H. (1909). *The distribution and functions of mental imagery*. New York: Columbia University, Teachers College.
- Biddle, S. J., & Bailey, C. L. (1985). Motives for participation and attitudes towards physical activity of adult participants in fitness programs. *Perceptual and Motor Skills, 61*, 831-834.
- Bird, E. (1984). EMG quantification of mental rehearsal. *Perceptual and Motor Skills, 59*, 899-906.
- Bohannon, R. W., & Leary, K. M. (1995). Standing balance and function over the course of acute rehabilitation. *Archives of Physical Medicine and Rehabilitation, 76*, 994-996.
- Brouwer, B. J., Walker, C., Rydahl, S. J., & Culham, E. G. (2003). Reducing fear of falling in seniors through education and activity programs: A randomized trial. *Journal of the American Geriatrics Society, 51*, 829-834.
- Bruce, D. G., Devine, A., & Prince, R. L. (2002). Recreational physical activity levels in healthy older women: The importance of fear of falling. *Journal of American Geriatric Society, 50*, 84-89.
- Budney, A. J., Murphy, S. M., & Woolfolk, R. L. (1994). Imagery and motor performance: What do we really know? In A. A. Sheikh & E. R. Korn (Eds.), *Imagery in sports and physical performance* (pp. 97-120). Amityville, NY: Baywood.
- Burish, T. G., & Jenkins, R. A. (1992). Effectiveness of biofeedback and relaxation training in reducing the side effects of cancer chemotherapy. *Health Psychology, 11*, 17-23.
- Cameron, I. D., Stafford, B., Cumming, R. G., Birks, C., Kurrle, S. E., Lockwood, K., Quine, S., Finnegan, T., & Salkeld, G. (2000). Hip Protectors improve falls self-efficacy. *Age Ageing, 29*, 57-62.
- Campbell, A. J., Reinken, J., Allan, B. C., & Martinez, G. S. (1981). Falls in old age: A study of frequency and related clinical factors. *Age Ageing, 10*, 264-270.

- Carpenter, W. B. (1894). *Principles of mental physiology*. New York: Appleton.
- Caudill, D., Weinberg, R., & Jackson, A. (1983). Psyching-up and track athletes: A preliminary investigation. *Journal of Sport Psychology*, 5, 231-235.
- Center for Disease Control and Prevention (2008a). Definition of quality of life. Retrieved from <http://www.cdc.gov/healthypplaces/terminology.htm#i> at August 3, 2008.
- Center for Disease Control and Prevention (2008b). How much physical activity do older adults need? Retrieved from <http://www.cdc.gov/physicalactivity/everyone/guidelines/olderadults.html> at March 16, 2009.
- Cheng, Y. L., Molassiotis, A., & Chang, A. M. (2003). The effect of progressive muscle relaxation training on anxiety and quality of life stoma surgery in colorectal cancer patients. *Psycho-Oncology*, 12(3), 254-266.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Confidence. (2008). *Dictionary.com Unabridged (v 1.1)*. Retrieved from <http://dictionary.reference.com/browse/confidence> at August 3, 2008.
- Cumming, R. G., Salkeld, G., Thomas, M., & Szonyi, G. (2000). Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores and nursing home admission. *Journal of Gerontology A*, 55, 299-305.
- Delbaere, K., Crombez, G., Vanderstraeten, G., Willems, T, & Cambier, D. (2004). Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. *Age Ageing*, 33, 368-373.
- Devereux, K., Robertson, D., Briffa, N. K. (2005). Effects of a water-based program on women 65 years and over: a randomised controlled trial. *The Australian Journal of Physiotherapy*, 51(2), 102-108.

- Driskell, J. E., Copper, C., & Moran, A. (1994). Does mental practice enhance performance? *Journal of Applied Psychology, 79*, 481-491.
- Durand, M., Hall, C., & Haslam, I. R. (1997). The effects of combining mental and physical practice on motor skill acquisition: A review of the literature and some practical implications. *The Hong Kong Journal of Sports Medicine and Sports Science, 4*, 36-41.
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*, 363-406.
- Evitt, C. P., & Quigley, P. A. (2004). Fear of falling in older adults: a guide to its prevalence, risk factors, and consequences. *Rehabilitation Nursing, 29*, 207-210.
- Feltz, D. L., & Landers, D. M. (1983). The effects of mental practice on motor skill learning and performance: A meta-analysis. *Journal of Sport Psychology, 5*, 25-57.
- Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London: Sage.
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage.
- Finke, R.A. (1989). *Principles of mental imagery*. Cambridge, MA: MIT Press.
- Fletcher, P. C., & Hirdes, J. P. (2004). Restriction in activity associated with fear of falling among community-based seniors using home care services. *Age Ageing, 33*, 273-279.
- Franzoni, S., Rozzini, R., Boffelli, S., Frisoni, G. B., & Trabucchi, M. (1994). Fear of falling in nursing home patients. *Gerontology, 40*, 38-44.
- Friedman, S. M., Munoz, B., West, S. K., Rubin, G. S., & Fried, L. P. (2002). Falls and fear of falling: which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. *Journal of American Geriatrics Society, 50*, 1329-1335.

- Gammage, K. L., Hall, C. R., & Rodgers, W. M. (2000). More about exercise imagery. *The Sport Psychologist, 14*, 348-359.
- Giacobbi, P. R. (2007). Age and activity-level differences in the use of exercise imagery. *Journal of Applied Sport Psychology, 19*, 487-493.
- Giacobbi, P. R., Hausenblas, H. A., & Fallon E. A. (2003). Even more about exercise imagery: A grounded theory of exercise imagery. *Journal of Applied Sport Psychology, 15*, 160-175.
- Giacobbi, P. R., Hausenblas, H. A., & Penfield, R. D. (2005). Further refinements in the measurement of exercise imagery: The exercise imagery inventory. *Measurement in Physical Education and Exercise Sciences, 4*, 251-266.
- Godin, G., Jobin, J., & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. *Canadian Journal of Public Health, 77*, 359-361.
- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Science, 10*, 141-146.
- Goss, S., Hall, C., Buckolz, E., & Fishburne, G. (1986). Imagery ability and the acquisition and retention of movements. *Memory and Cognition, 14*, 469-477.
- Gould, D., & Udry, E. (1994). Psychological skills for enhancing performance: Arousal regulation strategies. *Medicine and Science in Sports and Exercise, 26*, 478-485.
- Gravetter, F. J., & Wallnau, L. B. (2004). *Statistics for the behavioral sciences* (6th Ed.). Belmont, CA: Wadsworth and Thomson Learning.
- Gryfe, C. I., Amies, A., & Ashley, M. J. (1977). A longitudinal study on falls in an elderly population: Incidence and morbidity. *Age Ageing, 6*, 201-210.

- Hale, B. D. (1982). The effects of internal and external imagery on muscular and ocular concomitants. *Journal of Sport Psychology, 4*, 379-387
- Hale, B. D. (1994). Imagery perspectives and learning in sports performance. In A. A. Sheikh & E. R. Korn (Eds.), *Imagery in sports and physical performance* (pp. 75-96). Amityville, NY: Baywood.
- Hall, C. R. (1995). The motivational function of mental imagery for participation in sport and exercise. In J. Annett, B. Cripps, & H. Steinberg (Eds.), *Exercise addiction: Motivation for participation in sport and exercise* (pp. 15-21). Leicester, UK: British Psychological Society.
- Hall, C. R. (2001). Imagery in sport and exercise. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology*, (2nd ed., pp. 529-549). New York: John Wiley & Sons.
- Hall, C. R., Mack, D., Paivio, A., & Hausenblas H. (1998). Imagery use by athletes: Development of the Sport Imagery Questionnaire. *International Journal of Sport Psychology, 29*, 73-89.
- Hall, C. R., Moore, J., Annett, J., & Rodgers, W. (1997). Recalling demonstrated and guided movements using imaginary and verbal rehearsal strategies. *Research Quarterly for Exercise and Sport, 68*, 136-144.
- Hall, C. R., & Pongrac, J. (1983). *Movement Imagery Questionnaire*. London, Canada: University of Western Ontario.
- Hall, C. R., Rodgers, W. M., & Barr, K. A. (1990). The use of imagery by athletes in selected sports. *The Sport Psychologist, 4*, 1-10.
- Hall, C. R., Schmidt, D., Durand, M., & Buckolz, E. (1994). Imagery and motor skills acquisition. In A. A. Sheikh & E. R. Korn (Eds.), *Imagery in sports and physical performance* (pp. 121-134). Amityville, NY: Baywood.
- Hansma, A. H. G., Emmelot-Vonk, M. H., & Verhaar, H. J. J. (2009). Reduction in falling after a falls-assessment. *Archives of Gerontology and Geriatrics, 10*, 1-4.

- Harris, D. V., & Robinson, W. J. (1986). The effects of skill level on EMG activity during internal and external imagery. *Journal of Sport Psychology, 8*, 105-111.
- Haslam, R., & Stubbs, D. (2006). *Understanding and Preventing Falls*. Boca Raton, FL: Taylor & Francis Group.
- Hausenblas, H. A., Hall, C. R., Rodgers, W. M., & Munroe, K. J. (1999). Exercise imagery: Its nature and measurement. *Journal of Applied Sport Psychology, 11*, 171-180.
- Hedeker, D., & Gibbons, R. D. (1997). Application of random-effects pattern-mixture models for missing data in longitudinal studies. *Psychological Methods, 2*, 64-78.
- Herman, T., Inbar-Borovsky, N., Brozgol, M., Giladi, N., & Hausdorff, J. M. (2009). The dynamic gait index in healthy older adults: The role of stair climbing, fear of falling, and gender. *Gait and Posture, 29*, 237-241.
- Hetherington, M., & Burnett, L. (1994). Aging and the pursuit of slimness: Dietary restraint and weight satisfaction in elderly women. *British Journal of Clinical Psychology, 33*, 391-400.
- Hill, K. (2005). Activities-specific and Balance Confidence (ABC) Scale. *The Australian Journal of Physiotherapy, 51*(3), 197.
- Hird, J. S., Landers, D. M., Thomas, J. R., & Horan, J. J. (1991). Physical practice is superior to mental practice in enhancing cognitive and motor task performance. *Journal of Sport & Exercise Psychology, 8*, 281-293.
- Howland, J., Lachman, M. E., Peterson, E. W., Cote, J., Kasten, L., & Jette, A. (1998). Covariates of fear of falling and associated activity curtailment. *Gerontologist, 38*, 549-555.

- Howland, J., Peterson, E. W., Levin, W. C., Fried, L., Pordon, D., & Bak, S. (1993). Fear of falling among the community-dwelling elderly. *Journal of Aging Health, 5*, 229-243.
- Hunt, M., Bylsma, L., Brock, J., Fenton, M., Goldberg, A., Miller, R., Tran, T., & Urgelles, J. (2006). The role of imagery in the maintenance and treatment of snake fear. *Journal of Behavior Therapy and Experimental Psychiatry, 37*(4), 283-298.
- Indiana University (2009). Hatha yoga practice lessens fear of falling in older adults, study suggests. *ScienceDaily*, Retrieved March 14, 2009, from <http://www.sciencedaily.com/releases/2009/03/090309162115.htm>
- Jacobs, D., Ainsworth, B., Hartman, T., & Leon, A. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise, 25*, 81-91.
- Jacobson, E. (1931). Electrical measurement of neuromuscular states during mental activities. *American Journal of Physiology, 96*, 115-121.
- Jacobson, E. (1974). *Progressive relaxation. A physiological and clinical investigation of muscular states and their significance in psychology and medical practice*. Chicago, IL: University of Chicago Press.
- Jorstad, E. C., Hauer, K., Becker, C., & Lamb, S. E. (2005). Measuring the psychological outcomes of falling: A systematic review. *Journal of American Geriatrics Society, 53*, 501-510.
- Jung, D., Lee, J., & Lee, S. M. (2009). A meta-analysis of fear of falling treatment programs for the elderly. *Western Journal of Nursing Research, 31*(1), 6-16.

- Kempen G. I. J. M., Todd, C. J., van Haastregt, J. C.M., Rixt Zijlstra, G. A., Beyer, N., Freiburger, E., Hauer, K. A., Piot-Ziegler, C., & Yardley, L. (2007). Cross-cultural validation of the Falls Efficacy Scale International (FES-I) in older people: Results from Germany, the Netherlands, and the UK were satisfactory. *Disability and Rehabilitation, 29*(2), 155-162.
- Kempen, G. I. J. M., Yardley, L., van Haastregt, J. C. M., Rixt Zijlstra, G. A., Beyer, N., Hauer, K., & Todd, C. (2008). The short FES-I: a shortened version of the falls efficacy scale-international to assess fear of falling. *Age and Ageing, 37*, 45-50.
- Kim, B. H., & Giacobbi Jr., P. R. (2009). The use of exercise-related mental imagery by middle-aged adults. *Journal of Imagery Research in Sport and Physical Activity, 4*(1), Available at:
<http://www.bepress.com/jirspa/vol4/iss1/1>
- Kim, J., Singer, R. N., & Tennant, L. K. (1998). Visual, auditory and kinesthetic imagery on motor learning. *Journal of Human Movement Studies, 34*, 159-174.
- Kinugasa, T., Nagasaki, H., Furuna, T., & Itoh, H. (1996). Physical performance measures for characterizing high functioning older persons. *Journal of Aging and Physical Activity, 4*, 338-348.
- Kirkwood, G., Rampes, H., Tuffrey, V., Richardson, J., & Pilkington, K. (2005). Yoga for anxiety: A systematic review of the research evidence. *British Journal of Sports Medicine, 39*, 884-891.
- Klaus, L., Beniaminovitz, A., Choi, L., Greenfield, F., Whitworth, G. C., Oz, M. C., & Mancini, D. M. (2000). Pilot study of guided imagery use in patients with severe heart failure. *American Journal of Cardiology, 86*, 101-104.
- Kossert, A. L., & Munroe-Chandler, K. (2007). Exercise Imagery: A Systematic Review of the Empirical Literature. *Journal of Imagery Research in Sport and Physical Activity, 2*. Available at:
<http://www.bepress.com/jirspa/vol2/iss1/art2>.

- Kraemer, H. C., Wilson, G. T., Fairburn, C. G., & Agras, W. S. (2002). Mediators and moderators of treatment effects in randomized clinical trials. *Archives of General Psychiatry, 59*, 877-883.
- Kressig, R. W., Wolf, S. L., Sattin, R. W., O'Grady, M., Greenspan, A., Curns, A., & Kutner, M. (2001). Associations of demographic, functional, and behavioral characteristics with activity-related fear of falling among older adults transitioning to frailty. *Journal of American Geriatric Society, 49*, 1456-1462.
- Lachman, M. E., Howland, J., Tennstedt, S., Jette, A., Assmann, S., & Peterson, E. W. (1998). Fear of falling and activity restriction: The survey of activities and fear of falling in the elderly (SAFE). *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 53*, S43-S50.
- Lajoie, Y., & Gallagher, S. P. (2004). Predicting falls within the elderly community: comparison of postural sway, reaction time, the Berg balance scale and the Activities-specific Balance Confidence (ABC) scale for comparing fallers and non-fallers. *Archives of Gerontology and Geriatrics, 38*, 11-26.
- Lang, P. J. (1977). Imagery in therapy: An information-processing analysis of fear. *Behavior Therapy, 8*, 862-886.
- Lang, P. J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 16*, 495-512.
- Lawrence, R. H., Tennstedt, S. L., & Kasten, L. E. (1998). Intensity and correlates of fear of falling and hurting oneself in the next year: baseline findings from a Roybal Center fear of falling intervention. *Journal of Aging Health, 10*, 267-286.
- Legters, K. (2002). Fear of falling. *Physical Therapy, 82*, 264-272.
- Li, F., Fisher, J. K., Harmer, P., & McAuley, E. (2005). Falls self-efficacy as a mediator of fear of falling in an exercise intervention for older adults. *Journal of Gerontology: Psychological Studies, 60B*, 34-40.

- Li, F., McAuley, E., Fisher, J. K., Harmer, P., Chaumeton, N., & Wilson, N. L. (2002). Self-efficacy as a mediator between fear of falling and functional ability in the elderly. *Journal of Aging and Health, 14*, 452-466.
- Liddle J., & Gilleard, C. (1995). The emotional consequences of falls for older people and their families. *Clinical Rehabilitation, 9*, 110-114.
- Lubbert, K., Dahme, B., & Hasenbring, M. (2001). The effectiveness of relaxation training in reducing treatment-related symptoms and improving emotional adjustment in acute non-surgical cancer treatment: A meta-analytical review. *Psycho-Oncology, 10*, 490-502.
- MacIntyre, T., & Moran, A. (1996). Imagery use among canoeists: A worldwide survey of novice, intermediate, and elite slalomists. *Journal of Applied Sport Psychology, 8*, S132.
- Madigan, R., Frey, R. D., & Matlock, T. S. (1992). Cognitive strategies of university athletes. *Canadian Journal of Applied Sport Sciences, 17*, 135-140.
- Maki, B. E. (1997). Gait changes in older adults: Predictors of falls or indicators of fear? *Journal of American Geriatrics Society, 45*, 313-320.
- Maki B. E., Holliday P. J., & Topper A. K. (1991). Fear of falling and postural performance in the elderly. *Journal of Gerontology A, 46*, 123-131.
- Marcus, B. H., & Owen, N. (1992). Motivational readiness, self-efficacy, and decision-making for exercise. *Journal of Applied Social Psychology, 22*, 3-16.
- Marcus, B. H., Pinto, B. M., Simkin, L. R., Audrain, J. E., & Taylor, E. R. (1994). Application of theoretical models to exercise behavior among employed women. *American Journal of Health Promotion, 9*, 49-55.
- Markland, D., & Hardy, L. (1993). The Exercise Motivations Inventory: Preliminary development and validity of a measure of individuals' reasons for participation in regular physical exercise. *Personality and Individual Differences, 15*, 289-296.

- Martin, K. A., & Hall, C. R. (1995). Using mental imagery to enhance intrinsic motivation. *Journal of Sport & Exercise Psychology, 17*, 54-69.
- Mathes, S. A., & Battista, R. (1985). College men's and women's motives for participation in physical activity. *Perceptual and Motor Skills, 61*, 719-726.
- Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.
- McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of Behavioral Medicine, 15*, 65-88.
- McAuley, E., Bane, S. M., & Mihalko, M. S. (1998). Measuring exercise related self-efficacy. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 371-390). Morgantown, WV: Fitness Information Technology.
- McAuley, E., & Burman, G. (1993). The Social Physique Anxiety Scale: Construct validity in adolescent females. *Medicine and Science in Sports and Exercise, 25*, 1049-1053.
- McAuley, E. M., Mihalko, S. L., & Rosengren, K. (1997). Self-efficacy and balance correlates of fear of falling in the elderly. *Journal of Aging and Physical Activity, 5*, 329-340.
- McCormack, G., Lewin, G., McCormack, B., Helmes, E., Rose, E., & Naumman, F. Pilot study comparing the influence of different types of exercise intervention on the fear of falling in older adults. *Australian Journal on Ageing, 23*, 131-135.
- McKee, K. J., Orbell, S., Austin, C. A., Bettridge, R., Liddle, B. J., Morgan, K., & Radley, K. (2002). Fear of falling, falls efficacy and health outcomes in older people following hip fracture. *Disability and Rehabilitation, 6*, 327-333.
- McKellar, P. (1957). *Imagination and thinking*. London: Cohen & West.

- McMahon, C. E. (1973). Images as motives and motivators: A historical perspective. *American Journal of Psychology*, 86, 465-90.
- Milne M., Burke, S., Hall, C., Nederhof, E., & Gammage, K. (2006). Comparing the imagery use of older and younger adult exercisers. *Imagination, Cognition, and Personality*, 25, 59-67.
- Moore, R. J., & Spiegel, D. (2000). Uses of guided imagery for pain control by African-American and White women with metastatic breast cancer. *Integrative Medicine*, 2, 115-126.
- Morone, N. E., & Greco, C. M. (2007). Mind-body interventions for chronic pain in older adults: A structured review. *American Academy of Pain Medicine*, 8(4), 359-375.
- Munroe, K. J., Giacobbi, P. R., Hall, C.R., & Weinberg, R. (2000). The four w's of imagery use: Where, when, why, and what. *The Sport Psychologist*, 14, 119-137.
- Munroe-Chandler, K. J., & Gammage, K. L. (2005). Now see this: A new vision of exercise imagery. *Exercise and Sport Sciences Reviews*, 33(4), 201-205.
- Murphy J., & Issacs B. (1982). The post-fall syndrome: a study of 36 patients. *Gerontology*, 28, 265-270.
- Murphy, K. R., & Myers, B. (2004). *Statistical power analysis* (2nd ed.) Mahwah, NJ: Lawrence Erlbaum.
- Murphy S. L., Williams C. S., & Gill T. M. (2002). Characteristics associated with fear of falling and activity restriction in community-living older persons. *Journal of American Geriatrics Society*, 50, 516-520.
- Myers, A. M., Fletcher, P. C., Myers, A. H., & Sherk, W. (1998). Discriminative and evaluative properties of the Activities-specific Balance Confidence (ABC) Scale. *Journal of Gerontology Series: A Biological Science & Medical Science*, 53, M287-M294.

- Myers A. M., Powell L. E., Maki B. E., Holliday, P. J., Brawley, L. R., & Sherk, W. (1996). Psychological indicators of balance confidence: relationship to actual and perceived abilities. *Journal of Gerontology A*, 51, 37-43.
- Naparstek, B. (1994). *Staying well with guided imagery*. USA: Warner Books.
- National Center for Complementary and Alternative Medicine (2006). Health information. Mind-body medicine. Available at <http://nccam.nih.gov/health/backgrounds/mindbody.htm> (accessed February 18, 2008).
- Newton, R. A. (1997). *The Fall Prevention Program*. Retrieved from http://www.temple.edu/older_adult/fppmanual.html on July 25, 2008.
- Newton, R. A. (2001). Validity of the multi-directional reach test: A practical measure for limits of stability in older adults. *Journal of Gerontology: Medical Sciences*, 56A(4), M248-M252.
- Nitz, J. C., & Choy, N. L. (2004). The efficacy of a specific balance-strategy training programme for preventing falls among older people: A pilot randomized controlled trial. *Age and Ageing*, 33, 52-58.
- O' Loughlin, J. L., Robitaille, Y., Boivin, J. F., & Suissa, S. (1993). Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. *American Journal of Epidemiology*, 137(3), 342-354.
- Orlick, T. (1990). *In pursuit of excellence* (2nd ed.). Champaign, IL: Human Kinetics.
- Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Sciences*, 10, 22S-28S.
- Paivio, A. (1986). *Mental representations: A dual coding approach*. New York: Oxford University Press.

- Peterson, E. W. (2003). Using cognitive behavioral strategies to reduce fear of falling: A matter of balance. *The American Society on Aging, 26(4)*, 53-59.
- Pfurtscheller, G., Neuper, C., Ramoser, H., & Muller-Gerking, J. (1999). Visually guided motor imagery activates sensorimotor areas in humans. *Neuroscience Letters, 269*, 153-156.
- Pliner, P., Chaiken, S., & Flett, G. (1990). Gender differences in concern with body weight and physical appearance over the life span. *Personality and Social Psychology Bulletin, 16*, 263-273.
- Podsiadlo, D., & Richardson, S. (1991). The time "up & go": A test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society, 39(2)*, 142-148.
- Powell L.E., & Myers A. M. (1995). The activities-specific balance confidence (ABC) scale. *Journal of Gerontology: Medical Studies, 50A*, M28-M34.
- ProFaNE: Prevention of falls network Europe, Development and initial validation of the Falls Efficacy Scale-International (FES-I). www.profane.eu.org
- Prudham, D., & Grimley-Evans, J. (1981). Factors associated with falls in elderly: A community study. *Age Ageing, 10*, 141-146.
- Raub, J. A. (2002). Psychophysiologic effects of hatha yoga on musculoskeletal and cardiopulmonary function: A literature review. *Journal of Alternative Complement Medicine, 8*, 797-812.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd. ed.): Thousand Oaks, CA: Sage.
- Rawlings, E. I., Rawlings, I. L., Chen, S.S., & Yilk, D. (1972). The facilitating effects of mental rehearsal in the acquisition of rotary pursuit tracking. *Psychonomic Science, 26*, 71-73.
- Riley, D. (2004). Hatha yoga and the treatment of illness. *Alternative Therapy and Health Medicine, 10*, 20-21.

- Ringsberg, K. A. M., Gärdsell, P., Johnell, O., Jónsson, B., Obratn, K. J., & Sernbo, I. (1998). Balance and gait performance in an urban and a rural population. *Journal of American Geriatrics Society, 46*, 65-70.
- Rodgers, W. M., & Gauvin, L. (1998). Heterogeneity of incentives for physical activity and self-efficacy in high active and moderately active women exercisers. *Journal of Applied Social Psychology, 28*, 1016-1029.
- Rodgers, W. M., Hall, C. R., Blanchard, C. M., & Munroe, K. J. (1999). *The relationship between imagery and obligatory exercise*. Paper presented at the Canadian Psychomotor Learning and Sport Psychology Conference, Edmonton, Canada.
- Rodgers, W. M., Hall, C. R., Blanchard, C. M., & Munroe, K. J. (2001). Prediction of obligatory exercise by exercise-related imagery. *Psychology of Addictive Behaviors, 15*, 152-154.
- Rodgers, W. M., Hall, C. R., & Buckholtz, E. (1991). The effect of an imagery training program on imagery ability, imagery use, and figure skating performance. *Journal of Applied Sport Psychology, 3*, 109-125.
- Rodgers, W. M., Munroe, K. J., & Hall, C. R. (2001). Relations among exercise imagery, self-efficacy, exercise behavior, and intentions. *Imagination Cognition Personality, 21*, 55-65.
- Rodgers, W., & Sullivan, M. (2001). Task, coping and scheduling self-efficacy in relation to frequency of physical activity. *Journal of Applied Social Psychology, 31*, 741-753.
- Rushall, B. S. (1988). Covert modeling as a procedure for altering an elite athlete's psychological state. *The Sport Psychologist, 2*, 131-140.
- Sackett, R. S. (1934). The influences of symbolic rehearsal upon the retention of a maze habit. *Journal of General Psychology, 10*, 376-395.

- Salkeld, G., Cameron, I. D., Cumming, R. G., Easter, S., Seymour, J., Kurrie, S. E., & Quine, S. (2000). Quality of life related to fear of falling and hip fracture in older women: A time trade off study. *British Medical Journal*, 320, 341-346.
- Salmon, J., Hall, C., & Haslam, I. (1994). The use of imagery by soccer players. *Journal of Applied Sport Psychology*, 6, 116-133.
- Sattin, R. W., Easley, K. A., Wolf, S. L., Chen, Y., & Kutner, M. H. (2005). Reduction in fear of falling through intense tai chi exercise training in older, transitionally frail adults. *Journal of the American Geriatrics Society*, 53(7), 1168-1178.
- Scheffer, A. C., Schuurmans, M. J., Van Dijk, N., Van Der, Hooft T., & De Rooij, S. E. (2008). Fear of falling: measurement strategy, risk factors and consequences among older persons. *Age and Ageing*, 37, 19-24.
- Schoenfeld-Smith, K., Petroski, G. F., Hewett, J. E., Johnson, J. C., Wright, G. E., Smarr, K. L., Walker, S. E., & Parker, J. C. (1996). A biopsychosocial model of disability in rheumatoid arthritis. *Arthritis Care & Research*, 9, 368-375.
- Schoenfelder, D. P., & Rubenstein, L. M. (2004). An exercise program to improve fall-related outcomes in elderly nursing home residents. *Applied Nursing Research*, 17(1), 21-31.
- Sharaf, A. Y., & Ibrahim, H. S. (2008). Physical and psychosocial correlates of fear of falling: among older adults in assisted living facilities. *Journal of Gerontological Nursing*, 34(12), 27-35.
- Shumway-Cook, A., Brauer, S., & Woollacott, M. (2000). Predicting the probability for falls in community-dwelling older adults using the timed up & go test. *Physical Therapy*, 80(9), 896-903.
- Silberstein, L. R., Streigel-Moore, R. H., Timko, C., & Rodin, J. (1988). Behavioral and psychological implications of body dissatisfaction: Do men and women differ? *Sex Roles*, 19, 219-232.

- Simpson, J. M. (2003). *Concern about falling, balance confidence, concern regarding the consequences of falling*. Prevention of Falls Network Europe Work Package 4 Consensus Meeting. University of Southampton: Southampton, United Kingdom.
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.
- Skelton, D. A., Becker, C., & Lamb, S. E. (2004). Prevention of falls network europe: a thematic network aimed at introducing good practice in effective falls prevention across Europe. *European Journal of Aging, 1*, 89-94.
- Spano, A., & Forstl, H. (1992). Falling and the fear of it. *International Journal of Geriatric Psychiatry, 7*, 149-151.
- Speechley, M., & Tinetti, M. (1991). Falls and injuries in frail and vigorous elderly persons. *Journal of the American Geriatrics Society, 39*, 46-52.
- SPSS Inc. (2002). *SPSS Base 11.5 for Windows User's Guide*. SPSS Inc., Chicago IL.
- SPSS Inc. (2008). *SPSS Base 17.0 for Windows User's Guide*. SPSS Inc., Chicago IL.
- Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences* (4th ed.). Mahwah, NJ: Lawrence Erlbaum.
- Stewart, J. H. (2005). Hypnosis in contemporary medicine. *Mayo Clinical Proceedings, 80*, 511-524.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage Publications Inc.
- Suinn, R. M. (1972). Behavioral rehearsal training for ski racers. *Behavior Therapy, 3*, 519.
- Suinn, R. M. (1976). Body thinking: Psychology for Olympic champs. *Psychology Today, 38-43*.

- Tabachnick, B.G., & Fidell, L. S. (2006). *Using multivariate statistics (5th ed.)*. Boston: Allyn and Bacon.
- Tennstedt, S., Howland, J., Lachman, M., Peterson, E., Kasten, L., & Jette, A. (1998). A randomized, controlled trial of a group intervention to reduce fear of falling and associated activity restriction in older adults. *Journal of Gerontology: Psychological Sciences, 53B*, 384-392.
- Thomas, N. (2001). Mental imagery. *The Stanford Encyclopedia of Philosophy* (Winter 2001 Edition), Edward N. Zalta (ed.), Retrieved June 25, 2004 from <http://plato.stanford.edu/archives/win2001/entries/mental-imagery>
- Tideiksaar, R. (2002). *Falls in older people: Prevention and management*. Baltimore, MD: Health Professions Press.
- Tinetti, M. E. (1986). Performance-oriented assessment of mobility problems in elderly patients. *Journal of American Geriatric Society, 34*, 119-126.
- Tinetti, M. E., Mendes de Leon, C. F., Doucette, J. T., & Baker, D. I. (1994). Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *Journal of Gerontology, 49*, M140-M147.
- Tinetti, M. E., & Powell, L. (1993). Fear of falling and low self-efficacy: a case of dependence in elderly persons. *Journal of Gerontology, 48*, 35-38.
- Tinetti, M. E., Richman, D., & Powell, L. (1990). Falls efficacy as a measure of fear of falling. *Journal of Gerontology: Psychological Sciences, 45*, P239-P243.
- Tinetti, M. E., Speechley, M., & Ginter, S. F. (1998). Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine, 319*, 1701-1707.

- Tinetti, M. E., & Williams, C. S. (1998). The effects of falls and fall injuries on functioning in community-dwelling older persons. *Journal of Gerontology, 53A*, M112-119.
- Tinetti, M. E., Williams, T. F., & Mayewski, R. (1986). Fall risk index for elderly patients based on number of chronic disabilities. *American Journal of Medicine, 80*, 429-434.
- Todd, C. J., Freeman, C. J., Camilleri-Ferrante, C., Palmer, C., Hyder, A., Laxton, C. E., Parker, M. J., Payne, B. V., & Rushton, N. (1995). Differences in mortality after fracture of hip: The East Anglian audit. *British Medical Journal, 310*, 904-908.
- Tusek, D., Church, J., & Fazio, V. (1997). Guided imagery as a coping strategy for perioperative patients. *Association of Operating Room Nurses Journal, 66(4)*, 644-649.
- Van Kuiken, D. (2004). A meta-analysis of the effect of guided imagery practice on outcomes. *Journal of Holistic Nursing, 22*, 164-179.
- Vealey, R. S., & Walter, S. M. (1993). Imagery training for performance enhancement and personal growth. In J. M. Williams (Ed.), *Applied sport psychology: Personal growth to peak performance* (2nd ed., pp. 200-224). Mountain View, CA: Mayfield.
- Vellas, B. J., Wayne, S. J., & Romero, L. J. (1997). Fear of falling and restriction of mobility in elderly fallers. *Age and Ageing, 26*, 189-193.
- Veloza, C. A., & Peterson, E. W. (2001). Developing meaningful fear of falling measures for community dwelling elderly. *American Journal of Physical Medicine & Rehabilitation, 80*, 662-673.
- Vogt, S. (1995). On relations between perceiving, imagining and performing in the learning of cyclical movement sequences. *British Journal of Psychology, 86*, 191-216.

- Walker, J. E., & Howland, J. (1991). Falls and fear of falling among elderly persons living in the community: Occupational therapy interventions. *American Journal of Occupational Therapy, 45*, 119-122.
- Walker, L. G., Walker, M. B., Ogston, K., Heys, S. D., Ah-See, A. K., Miller, I. D., Hutcheon, A. W., Sarkar, T. K., & Eremin, O. (1999). Psychological, clinical and pathological effects of relaxation training and guided imagery during primary chemotherapy. *British Journal of Cancer, 80*(1-2), 262-268.
- Weinberg, R. S., & Gould, D. (2003). *Foundations of sport and exercise psychology* (2nd ed.). Champaign, IL: Human Kinetics.
- Wesch, N. N., Milne, M. I., Burke, S. M., & Hall, C. R. (2006). Self-efficacy and imagery use in older adult exercisers. *European Journal of Sport Science, 6*(4), 197-203.
- White, A., & Hardy, L. (1998). An in-depth analysis of the uses of imagery by high-level slalom canoeists and artistic gymnasts. *The Sport Psychologist, 12*, 387-403.
- Whitney, J. C., Lord, S. R., Close, J. C. T. (2005). Streamlining assessment and intervention in a falls clinic using the timed up and go test and physiological profile assessments. *Age and Ageing, 34*, 567-571.
- Wickens, T. D., & Keppel, G. (2004). *Design and analysis: A researcher's handbook* (4th ed.). Englewood Cliffs, NJ: Prentice-Hall.
- Wiederhold, B. K., Jang, D. P., Gevirtz, R. G., Kim, S. I., Kim, I. Y., & Wiederhold, M. D. (2002). The treatment of fear of flying: a controlled study of imaginal and virtual reality graded exposure therapy. *IEEE Transactions on Information Technology in Biomedicine: A Publication of the IEEE Engineering in Medicine and Biology Society, 6*(3), 218-223.
- Willumsen, T., Vassend, O., & Hoffart, A. (2001). A comparison of cognitive therapy, applied relaxation, and nitrous oxide sedation in the treatment of dental fear. *Acta Odontologica Scandinavica, 61*(2), 93-99.

- Wilson, P. M., Rodgers, W. M., Hall, C. R., & Gammage, K. L. (2003). Do autonomous exercise regulations underpin different types of exercise imagery? *Journal of Applied Sport Psychology, 15*, 294-306.
- Wójcicki, T. R., White, S. M., & McAuley, E. (2009). Assessing outcome expectations in older adults: The multidimensional outcome expectations for exercise scale. *Journal of Gerontology Psychological Sciences, 64(1)*, 33-40.
- Wolf, S. L., Barnhart, H. X., Kutner, N. G., McNeely, E., Coogler, C., & Xu, T. (1996). Reducing frailty and falls in older persons: An investigation of tai chi and computerized balance training. *Journal of American Geriatrics Society, 44*, 489-497.
- Wolsko, P. M., Eisenberg, D. M., Davis, R. B., & Phillips, R. S. (2004). Use of mind-body medical therapies. *Journal of General Internal Medicine, 19(1)*, 43-50.
- Wynd, C. A. (2005). Guided health imagery for smoking cessation and long-term abstinence. *Journal of Nursing Scholarship, 37(3)*, 245-250.
- Yardley, L., Beyer, N., Hauer, K., Kempen, G., Piot-Ziegler, C., & Todd, C. (2005). Development and initial validation of the Falls Efficacy Scale International (FES-I). *Age Ageing, 34*, 614-619.
- Yardley, L., & Smith, H. A. (2002). A prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. *Gerontologist, 42*, 17-23.
- Yates, F. A. (1966). *The art of memory*. London: Routledge and Kegan Paul.
- Yoo, H. J., Ahn, S. H., Kim, S. B., Kim, W. K., & Han, O. S. (2005). Efficacy of progressive muscle relaxation training and guided imagery in reducing chemotherapy side effects in patients with breast cancer and in improving their quality of life. *Support Care Cancer, 10*, 826-833.

Zijlstra, G. A., van Haastregt, J. C. M., van Rossum, E., van Eijk, J. T. M., Yardley, L., & Kempen, G. I. (2007). Interventions to reduce fear of falling in community-living older people: A systematic review. *Journal of American Geriatrics Society, 55*, 603-615.

APPENDIX A
INFORMED CONSENT FORM

RESEARCH PARTICIPANT INFORMATION AND CONSENT FORM

TITLE: The Effects of Guided Relaxation and Exercise Imagery on Older Adults who have a Fear of Falling.

PROTOCOL NUMBER: 11701

PARTICIPANT'S NAME: _____
ID#: _____

PRINCIPAL INVESTIGATOR: Michael Sachs, PhD
Department of Kinesiology
Temple University
Telephone: (215) 204-8718
Email: msachs@temple.edu

STUDENT INVESTIGATOR: Bang Hyun Kim, M.S.
Department of Kinesiology, PH 130
Temple University
Telephone: (215) 204-8718
Email: bkim@temple.edu

SITE: Caring People Alliance, 3512 Haverford Avenue,
Philadelphia, PA
Philadelphia Senior Center Tioga Branch, 1531 W
Tioga St, Philadelphia, PA.
The Aquatic Fitness Center, 3600 Grant Avenue,
Philadelphia, PA.
The Korean Senior Center, 6101 Rising Sun Ave,
Philadelphia, PA
Chestnut Hill Senior Center, 7999 Crittenden St,
Philadelphia, PA
Renewal Presbyterian Church, 4801 Spruce St,
Philadelphia, PA
Antioch Presbyterian Church, 2500 Ridge Pike,
Philadelphia, PA

This consent form may contain words that you do not understand. Please ask the researcher to explain any words or information that you do not clearly understand. You may take home an unsigned copy of this consent form to think about or discuss with family or friends before making your decision. Temple University is not being compensated for performing this study.

PURPOSE OF THE STUDY

Approximately 50% of community-dwelling older adults experience a fear of falling. The experience of a fall might be a plausible reason that older adults develop a fear of falling (FOF), but FOF is also prevalent for non-fallers. Therefore, it is possible that other factors such as process of aging, physical frailty, or other social factors, such as hearing a friend experience a detrimental fall, might contribute to the development of FOF as well.

An effective and practical tool that can be used to decrease FOF rates might be guided imagery. Guided Relaxation and Exercise Imagery (GREI) is a simple, low cost therapeutic tool that can help counteract individuals with fear and anxiety. Physiologically, GREI has been shown to help lesson autonomic nervous system responses, reduce skeletal muscle contraction, uncomfortable sensations, and other responses to stress, making it a possible alternative tool for adults who have a FOF and cannot perform the physical activities recommended by successful FOF intervention studies such as home-based exercises or tai chi.

The main purpose of this study is to examine the effects of a six-week intervention study that uses GREI techniques on lowering FOF rates among community dwelling adults aged 60 and above. A secondary purpose is to study the effect of GREI techniques on self-efficacy, self-confidence, exercise imagery use, exercise levels, and specific simple mobility tests.

PROCEDURES

This will be a six week study with two extra days for pre and post testing. You will meet with the researcher individually at a senior center on a pre-scheduled meeting time. The study will begin with a brief introduction of the researcher and the purpose of the study. The researcher will then ask you to fill out an informed consent. After the informed consent has been completed, the researcher will ask you to fill out the demographic/screening form. If you cannot read or need assistance, the researcher will ask the questions verbally. If you answer 'yes' to certain questions on the demographic/screening form, it will be excluded you from the study.

If you qualify and agree to do the study, you will fill out the Exercise Imagery Inventory (EII; Giacobbi,

Hausenblas, & Penfield, 2005), Short Falls Efficacy Scale - International (Short FES-I; Kempen et al., 2008), Activities-specific Balance and Confidence Scale (ABC Scale; Powell & Myers, 1995), and the Leisure Time Exercise Questionnaire (LTEQ; Godin & Shephard, 1985). Each questionnaire will take approximately 5-10 minutes to complete.

After the questionnaires are completed, the researcher will administer two simple performance measures which are the Timed Up and Go (TUG; Podsiadlo & Richardson, 1991; Shumway-Cook, Brauer, & Woollacott, 2000) and the One Leg Stance (OLS; Berg Wood-Dauphinnee, Williams, & Gayton, 1989). These performance measurements were used in previous fear of falling studies and showed positive relationships to confidence levels of performing the tests without falling. A spotter will be next to you at all times while performing the mobility tests. After filling out the questionnaires and performing the mobility tests, you will be randomly placed in one of four groups by the researcher.

IF YOU ARE PLACED IN GROUPS ONE OR FOUR PLEASE READ THE FOLLOWING INSTRUCTIONS:

If you are placed in groups one or four you will be given an audio Compact Disk (CD) that will consist of one introductory track and two guided relaxation tracks (same relaxation tracks given in the intervention group). You will also be asked to listen to music for five minutes of your choice after listening to a relaxation track. You will listen to the relaxation track and songs of your choice for six weeks, two times a week (days of their choice but have to be consistent days throughout the six weeks), and for 10 minutes a session (time of their choice but has to be consistent times throughout the six weeks). After listening to one of the two relaxation tracks, you will be asked to listen to different music during each of the 12 days. You will be also be given an instruction booklet and a checklist to monitor their progress during the six weeks. If you are in groups one or four you will receive a Guided Relaxation and Exercise Imagery (GREI) audio CD and instruction booklet when you complete the study. Please refer to Table 2 for an overview of the study.

IF YOU ARE PLACED IN GROUPS TWO OR THREE PLEASE READ THE FOLLOWING INSTRUCTIONS:

If you are in groups two or three you will be given an audio GREI CD created by the researcher. This CD will consist of one introduction track, two guided relaxation tracks, and 11 guided imagery tracks (Table 1). You will also be given an instruction booklet and a checklist to monitor their progress. You will be asked to listen to the GREI CD two times (only once a day, 10 minutes a day) a week for six weeks. The researcher will emphasize while giving out the CD to only listen to the given track on the given day as instructed in the instruction booklet. This will be an important factor in the study and the researcher will ask you to sign a trust agreement letter stating that you will only listen to the given track on a given day listed in the instruction booklet. You will also be instructed to be consistent with the time and day that they will be listening to the CD during the six weeks. For example, if you listen to the GREI CD on Mondays and Wednesdays at 9:00 am, you will be asked to listen to the CD at those times during the six week intervention period. After the six weeks, the researcher will meet with you and will give the same instrumentations that were given in the pretest. Please refer to Table 2 for an overview of the study.

RISKS AND DISCOMFORTS

The foreseeable risks or ill effects from participating in this study are minimal. You may be at risk of falling when you do the Timed Up and Go Test (TUG) and the one-leg stance but the researcher will stand next to you during these tests and stop you from falling in case you lose your balance.

NEW FINDINGS

You will be told about new information that might change your decision to be in this study. You may be asked to sign a revised informed consent form that contains the new information.

BENEFITS

By participating in this study, you may benefit from using relaxation and exercise imagery techniques to help decrease rates of fear of falling and increase motivation, efficacy, imagery use, and perceived exercise levels.

COSTS

All material costs related to this study (e.g., CD, instructional booklet, checklist) will be provided at no cost to you.

PAYMENT FOR PARTICIPATION

You will receive a Guided Relaxation and Exercise Imagery (GREI) audio CD at the completion of the study.

ALTERNATIVE TREATMENT

This is not a treatment study. Your alternative is to not participate in this study.

CONFIDENTIALITY

All documents and information pertaining to this research study will be kept confidential in accordance with all applicable federal, state, and local laws and regulations. I understand that medical records and data generated by the study may be reviewed by Temple University's Institutional Review Board and the Office for Human Subjects Protections (OHRP) to assure proper conduct of the study and compliance with federal regulations. I understand that the results of this study may be published. If any data is published, I will not be identified by name.

COMPENSATION FOR INJURY

Although efforts will be made to protect you from any injuries during the study, if the unfortunate event of sustaining an injury as a result of your participation in this study, the physicians' fees and medical expenses that result will be billed to your insurance company or you in the usual manner. Other financial compensation (such as lost wages or pain and suffering) for such injuries is not routinely available. By signing this consent form you are not waiving any of the legal rights that you otherwise would have as a participant in a research study.

VOLUNTARY PARTICIPATION AND WITHDRAWAL

Your participation in this study is entirely voluntary, and refusal to participate will involve no penalty or loss of benefits to you. You may discontinue your participation at any time without penalty or loss of benefits. Your participation may be stopped at any time by the researcher or your program coordinator without your consent.

REASONS FOR REMOVAL FROM THE STUDY

The researchers can terminate your participation without your consent. The anticipated circumstances under which this might occur include failure to comply with instructions or missing scheduled sessions and study visits.

QUESTIONS

If you have any questions about your rights as a research participant, you may contact the Institutional Review Board Manager, Richard Throm at (215) 707-8757.

If you have any questions about the study or any additional questions you may contact or Bang Hyun Kim at (215) 204-8718 or Michael Sachs, PhD at (215) 204-8718.

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your questions.

If you agree to participate in this study, you will receive a signed and dated copy of this consent form for your records.

CONSENT

'I have read this consent form and the study has been explained to me. All my questions about the study and my participation in it have been answered. I freely consent to participate in this research study. By signing this consent form, I have not waived any of the legal rights that I otherwise would have as a subject in a research study.'

"The Effects of Guided Relaxation and Exercise Imagery on Older Adults who have a Fear of Falling."

Participant's Name

Participant's Signature

Date

Researcher Signature

Date

APPENDIX B
DEMOGRAPHIC/SCREENING FORM

PARTICIPANT ID: _____ Date: _____

DEMOGRAPHIC/SCREENING FORM FOR 'A PILOT STUDY ON THE USE OF
GUIDED EXERCISE IMAGERY ON ADULTS WHO HAVE A FEAR OF
FALLING'

NAME (or ID number): _____

Phone or email: _____

GENDER: M / F AGE: _____ D.O.B. _____

RACE: AFRICAN AMERICAN / ASIAN / CAUCASIAN / LATINO
/ OTHER

ITEMS:

1. In the past month, have you had any falls including a slip or trip in which you lost your balance and landed on the floor or ground or lower level?

Yes / No

-If yes, did you fall indoors or outdoors? Indoors
/ Outdoors

-Were you able to get up after the fall? Yes / No

-Did the fall result in a fracture? Yes / No

-Did the fall result in hospitalization? Yes / No

2. Do you have poor strength in your legs? Yes / No

3. Do you use an assistive device (e.g., walker or cane)?

Yes / No

-If yes, what kinds of assistive devices do you use?

-Do you use a wheelchair? Yes / No

4. Do you have problems with your eyesight? Yes / No

-If yes, is it corrected by glasses? Yes / No

5. Do you have any discomfort during casual walking or stair climbing? Yes / No

6. Do you have a problem keeping your balance? Yes / No

7. Do you feel dizzy/lightheaded or do you pass out when you stand up? Yes / No
8. Do you have a history of Parkinson's disease?
Yes / No
-If yes, does this restrict you from doing activities?
Yes / No
9. Do you have a heart condition? Yes / No
-High Blood Pressure? Yes / No
-Uncontrolled heart disease (Hypertension: BP \geq 140/90)?
Yes / No
-Do you have a history of a stroke? Yes / No
-Diabetes? Yes / No
-If yes to any of the questions, does this (these) restrict you from doing activities?
Yes / No
-If yes, is it currently being treated? Yes / No
10. Do you have osteoporosis / rheumatoid arthritis?
Yes / No
-Severe rheumatoid arthritis? Yes / No
11. Do you have a history of a drug or alcohol abuse?
Yes / No
12. Do you have trouble hearing? Yes / No
13. Do you have a history of Alzheimer's disease?
Yes / No
14. Do you have a fear of falling? Yes / No
-If yes, does fear of falling limit your activities?
Yes / No
15. Do you feel you should be more physically active than you are? Yes / No
16. Are you taking four or more medications? Yes / No
17. How do you describe your health?
Excellent / Good / Fair / Poor
18. Have you fallen in the past three months? Yes / No

APPENDIX C
EXERCISE IMAGERY INVENTORY
(Giacobbi et al., 2005)

THE EXERCISE IMAGERY INVENTORY

The following questions deal with imagery and exercise participation. *Imagery* involves “*mentally*” seeing yourself exercising. The image in your mind should approximate the actual physical activity as closely as possible. Imagery may include sensations like hearing the aerobic music and feeling yourself move through the exercises. Imagery can also be associated with emotions (e.g., getting psyched up or energized), staying focused (concentrating on aerobic class and not being distracted), setting exercise plans/goals (e.g., imaging achieving goal of losing weight), etc. There are no right or wrong answers so please answer as accurately as possible. Please answer the following questions with regard to how often you use mental imagery (rarely to often).

1	2	3	4	5	6	7
Rarely						Often

1. I imagine a “fitter-me” from exercising_____.
2. I imagine completing my workout_____.
3. When I think about exercising, I imagine the perfect technique_____.
4. I imagine being more relaxed from exercising_____.
5. I imagine a “leaner-me” from exercising_____.
6. I imagine having the confidence to exercise_____.
7. When I think about exercising, I imagine my form and body position_____.
8. I imagine how I will feel after I exercise_____.
9. I imagine being toned from exercising_____.
10. I imagine having the confidence to complete my workout_____.
11. I imagine being healthier from exercising_____.
12. I imagine losing weight from exercising_____.
13. When I think about exercising, I imagine doing the required movements_____.
14. I imagine becoming more fit_____.
15. I imagine the perfect exercise technique_____.
16. I imagine getting in better shape_____.
17. I imagine reducing my stress from exercising_____.
18. I imagine a “firmer-me” from exercising_____.
19. I imagine feelings associated with exercising_____.

APPENDIX D
THE ACTIVITIES AND BALANCE CONFIDENCE SCALE
(Powell & Myers, 1995)

The Activities-specific Balance Confidence (ABC) Scale*

Instructions to Participants:

For each of the following, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale from 0% to 100%. If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as it you were using these supports. If you have any questions about answering any of these items, please ask the administrator.

The Activities-specific Balance Confidence (ABC) Scale*

For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:

0%	10	20	30	40	50	60	70	80	90
100%									
no confidence								completely	
confident									

"How confident are you that you will not lose your balance or become unsteady when you...

1. ...walk around the house? _____%
2. ...walk up or down stairs? _____%
3. ...bend over and pick up a slipper from the front of a closet floor _____%
4. ...reach for a small can off a shelf at eye level? _____%
5. ...stand on your tiptoes and reach for something above your head? _____%
6. ...stand on a chair and reach for something? _____%
7. ...sweep the floor? _____%

8. ...walk outside the house to a car parked in the driveway?
_____%
9. ...get into or out of a car? _____%
10. ...walk across a parking lot to the mall? _____%
11. ...walk up or down a ramp? _____%
12. ...walk in a crowded mall where people rapidly walk past you? _____%
13. ...are bumped into by people as you walk through the mall? _____%
14. ... step onto or off an escalator while you are holding onto a railing? _____%
15. ... step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? _____%
16. ...walk outside on icy sidewalks? _____%

APPENDIX E
SHORT FALLS EFFICACY SCALE - INTERNATIONAL VERSION
(Kempen et al., 2008)

Short Falls Efficacy Scale (Short FES-I)

Introduction:

Now we would like to ask some questions about how concerned you are about the possibility of falling. Please reply thinking about how you usually do the activity. If you currently do not do the activity, please answer to show whether you think you would be concerned about falling IF you did the activity. For each of the following activities, please tick the box which is closest to your own opinion to show how concerned you are that you might fall if you did this activity.

1. Getting dressed or undressed
2. Taking a bath or shower
3. Getting in or out of a chair
4. Going up or down stairs
5. Reaching for something above your head or on the ground
6. Walking up or down a slope
7. Going out to a social event (e.g. religious service, family gathering or club meeting)

Answer options:

- 1. Not at all concerned
- 2. Somewhat concerned
- 3. Fairly concerned
- 4. Very concerned

APPENDIX F
LEISURE TIME EXERCISE QUESTIONNAIRE
(Godin & Shephard, 1985)

Godin Leisure-Time Exercise Questionnaire

1. During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number).

Times Per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, easy walking)

APPENDIX G
INSTRUCTIONAL BOOKLET FOR CONTROL GROUPS

**INSTRUCTIONS GUIDE LISTENING TO GUIDED RELAXATION CD AND
MUSIC OF CHOICE**

BEFORE YOU BEGIN LISTENING TO THE CD PLEASE GET INTO A COMFORTABLE POSITION (e.g., lying down on a bed, sitting on a comfortable chair), DIM THE LIGHTS, CLOSE YOUR EYES AND RELAX!

ENJOY!

1. WEEK 1

Day 1:

1. Please listen to **TRACK 1**.
2. After you have finished listening to **TRACK 1**, please write today's date and list what you listened to in the CHECKLIST.

Day 2:

1. Please listen to **TRACK 2**.
2. After you have finished listening to **TRACK 2**, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the **CHECKLIST**.

2. WEEK 2

Day 3:

1. Please listen to **TRACK 3**.
2. After you have finished listening to **TRACK 3**, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the **CHECKLIST**.

Day 4:

1. Please listen to **TRACK 2**.
2. After you have finished listening to **TRACK 2**, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the **CHECKLIST**.

3. WEEK 3

Day 5:

1. Please listen to TRACK 3.
2. After you have finished listening to TRACK 3, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

Day 6:

1. Please listen to TRACK 2.
2. After you have finished listening to TRACK 2, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

4. WEEK 4

Day 7:

1. Please listen to TRACK 3.
2. After you have finished listening to TRACK 3, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

Day 8:

1. Please listen to TRACK 2.
2. After you have finished listening to TRACK 2, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

5. WEEK 5

Day 9:

1. Please listen to TRACK 3.
2. After you have finished listening to TRACK 3, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

Day 10:

1. Please listen to TRACK 2.
2. After you have finished listening to TRACK 2, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

6. WEEK 6

Day 11:

1. Please listen to TRACK 3.
2. After you have finished listening to TRACK 3, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

Day 12:

1. Please listen to TRACK 2.
2. After you have finished listening to TRACK 2, **please listen to a music of choice for 5 minutes.**
3. After you have listened to music of choice, please write today's date and list what you listened to in the CHECKLIST.

**CONGRATULATIONS! YOU HAVE COMPLETED THE CD. IF YOU LIKE,
YOU MAY LISTEN TO THE CD AFTER THE STUDY HAS BEEN
COMPLETED!
THANKS AGAIN!**

APPENDIX H
CHECKLIST FOR CONTROL GROUP

CD CHECKLIST

PLEASE CIRCLE ONE AND FILL IN THE BLANKS

WEEK 1:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
WEEK 2:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
WEEK 3:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
WEEK 4:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___

WEEK 5:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ and Music of Choice was _____ TODAY'S DATE ___/___/___
WEEK 6:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ TODAY'S DATE ___/___/___

CONGRATULATIONS! YOU HAVE FINISHED THE CD. PLEASE USE THE SPACE BELOW TO WRITE ANY COMMENTS/QUESTIONS.

APPENDIX I
INTRODUCTION DRAFT TO GREI CD

Hello, welcome to the guided relaxation and exercise imagery CD. I first want to thank you for participating in this study and I hope that you will be able to learn how to use imagery on your own and find out the numerous benefits of using relaxation and imagery. You will be listening to this CD for the next six weeks. I only require you to listen to four tracks per week (two relaxation and two imagery tracks), but if you like you may use imagery on your own anyplace, anytime of the day. If you look in the instruction booklet that comes along with this CD, it tells you what tracks to listen to each day. Please take the time to look at the instructions now...(A FEW MOMENTS PAUSE). Have you taken a look at the instructions? Good! Remember after each session, please write down your progress such as recording the day you listened to the CD and what tracks you have listened to. During the next six weeks you will be listening to 12 different imagery tracks. There are also two different relaxation tracks that you have to listen to before you listen to the imagery tracks. Again, please read and follow the instructions carefully. It is really important that you follow the instructions and ONLY listen to the tracks that are given in the instruction

booklet for that day. Also, please remember for the purposes of this study, the following imagery tracks were made from broad settings and universal themes so it may not relate exactly to your personal experiences. However, all the tracks were created to closely match your daily livings and will enrich you with plenty of wonderful images and will give you a pleasant time. So please sit back, relax, and enjoy!

APPENDIX J
VIVIDNESS/CONTROLLABILITY EXERCISE

Guided imagery is based on the concept that your body and mind are connected. Using all of your senses, your body seems to respond as though what you are imagining is real. An example often used is to imagine an orange or a lemon in great detail—the smell, the color, the texture of the peel. Continue to imagine the smell of the lemon, and then see yourself taking a bite of the lemon and feel the juice squirting into your mouth. Many people salivate when they do this. This exercise demonstrates how your body can respond to what you are imagining.

APPENDIX K
PROGRESSIVE MUSCLE RELAXATION (PMR) SCRIPT

Example:

"Sit in a comfortable chair - reclining arm chairs are ideal. Lying on a bed is okay too. Get as comfortable as possible - no tight clothes or shoes and don't cross your legs. Take a deep breath; let it out slowly. Again. What you'll be doing is alternately tensing and relaxing specific groups of muscles. After tension, a muscle will be more relaxed than prior to the tensing. Concentrate on the feel of the muscles, specifically the contrast between tension and relaxation. In time, you will recognize tension in any specific muscle and be able to reduce that tension. Don't tense muscles other than the specific group at each step. Don't hold your breath, grit your teeth, or squint. Breathe slowly and evenly and think only about the tension-relaxation contrast. Each tensing is for 10 seconds; each relaxing is for 10 or 15 seconds. Count "1,000 2,000..." until you have a feel for the time span. Note that each step is really two steps - one cycle of tension-relaxation for each set of opposing muscles."

APPENDIX L
DEEP BREATHING SCRIPT

1. Lie down or sit in a comfortable chair, maintaining good posture. Your body should be as relaxed as possible. Close your eyes. Scan your body for tension.
2. Pay attention to your breathing. Place one hand on the part of your chest or abdomen that seems to rise and fall the most with each breath. If this spot is in your chest you are not utilizing the lower part of your lungs.
3. Place both hands on your abdomen and follow your breathing noticing how your abdomen rises and falls.
4. Breathe through your nose.
5. Notice if your chest is moving in harmony with your abdomen.
6. Now place one hand on your abdomen and one on your chest.
7. Inhale deeply and slowly through your nose into your abdomen. You should feel your abdomen rise with this inhalation and your chest should move only a little.
8. Exhale through your mouth, keeping your mouth, tongue, and jaw relaxed.
9. Relax as you focus on the sound and feeling of long, slow, deep breaths.

APPENDIX M
GREI EXAMPLES

EXAMPLE 1: Walking around a busy mall

It is a late Saturday afternoon and you decide to talk a walk around your local mall. You want to walk around the mall to get some exercise. You are a little worried because it is a Saturday afternoon and you know there will be big crowds of people. You really don't like walking around in big crowds because the tripping or falling increase. However, today, you don't want that to be a barrier.

You arrive at the mall around 3 pm. As you are walking to the entrance you notice many people walking in and out of the mall. You slowly walk to the entrance and smartly use the entrance that has a button to open the doors. You press the button making the entrance doors open automatically. As the doors open, you walk into the mall. As you enter the mall, you hear the sounds of people talking, kids screaming, and some music in the background. You also smell a nice smell of freshly baked pretzels and notice that is coming from the left shop beside the entrance that sells pretzels. It smells sweet and tasty. You are tempted by the smell to get a pretzel but decide not to, at least for now. You start walking slowly around

the shops and notice how many shops there are. The mall is a pretty big mall, two stories high and about 100 plus stores. You really don't have anything to buy. You just want to walk. Get some exercise. You also like to eye shop and observe the people around you.

You slowly walk passing store by store. There are many people walking towards and behind you. Although most people are walking faster than you, you don't mind them. Just keep my own pace, you tell yourself. Just have confident steps, you tell yourself. As you are walking, you get the occasional bumps and touches from other people especially in tight spaces, but you do not mind. After awhile, you notice a clothing shop you like to shop in. You decide to take a look in there and see if there are any new seasonal clothes that might come to your interest. As you are walking in the store, a person who works there kindly greets you. You kindly greet back. She asks if you need any help. You kindly say that you are just looking. She tells you her name and says to get her if you need any assistance. You say thank you and you start looking at clothes. About 20 minutes pass and you are finished taking a look around the store. This time you didn't find anything you liked so you decide to leave and walk around

again. You kindly thank the worker and walk out to other stores.

You walk around for another 15 minutes and decide to take a little break. You find an empty bench and sit there for a while. You sit and look around observing the people around you. You notice parents walking around with their kids, young teenagers walking around with their friends, people who are alone but talking loudly on their cell phones, couples holding hands slowly walking and doing eye shopping, and to the left you notice an elderly slowly walking around. You take a closer look and see that it is a friend of yours! You yell out your friend's name and it gets your friend attention. Your friend makes eye contact with you and greets you from far away with a smile! You are happy to see your friend and give a swing of the hand to come sit with you. Your friend arrives and sits next to you. It has been awhile since you last saw your friend and you are really happy to see your friend. You ask why your friend is here and your friend replies by saying, "I came here to walk and get some exercise." You smile and say that you are here for the same reason. You talk and agree to walk with your friend for a little more. It is always nice to have a companion. You and you friend get up from

the bench and enjoy the rest of the afternoon walking, talking, and having a great time.

EXAMPLE 2: Walking around the supermarket

It is a mid Saturday afternoon and you are inside your neighborhood's grocery store. You just got your shopping cart and really to go for a stroll through the grocery store. You already made a checklist of the items you want to buy. You want to buy some apples, eggs, milk, and bread. You slowly walk along with your cart into the produce section first. As you are walking, you are holding the cart firmly with both hands so it is easier for you to walk. You take a look around and notice the bright vibrant colors of all the different fruits and vegetables. Yellow, orange, green, red, brown, purple, the place is full with fresh fruits and vegetables. All these colors around you make you feel happy. The produce section is well refrigerated and it is chilly. You feel a slight chill around your body, but that chill goes away quickly. You walk to the apple section and look at the different varieties of apples. Fuji, Gala, McIntosh, Golden Delicious, there are so many choices! You remember that you tried the Gala apple and it was sweet and crunchy so you decide to buy some Gala apples today. As you are picking the apples, you pick the ones that have no molds, firm in texture and fresh in color.

You pick a few apples, put them in a plastic bag, tie the bag and put it in your cart.

You walk along with your cart into the dairy section to buy eggs and milk. You go to the egg section first and pick up a carton of eggs. You open the carton just in case there is a cracked egg. Thankfully you checked the carton because there was a cracked egg. You put that carton down and pick up another carton. You open it and examine the eggs one by one. You notice that each egg is not cracked and you close the carton and gently put the eggs in your cart. You now look at the milk choices. You look at the dates of the milk and see the one that is most recent with the longest expiration date. You pick up a half of gallon of milk and put in the cart.

You are now walking slowly with your cart into the bread aisle. It is a few aisles away and you are walking slowly but very securely since you have the cart to maintain balance and control. As you are walking, you notice a "be careful, wet floor" sign. You want to avoid the area but since the bread aisle is right after the sign you decide to carefully walk through the wet floor area. You think to yourself, "I am not going to fall. I know this is a slippery area, I have good balance and control by holding my cart and good firm steps." You slowly walk

through the wet floor. You take slow and firm steps. Although they are people behind you waiting for you to cross, you do not care about them. "My health, my body is far more important than to hurry myself because of the people waiting behind and possibly falling." That is what you keep saying to yourself as you are walking through the wet floor area. A couple of more steps...finally! You did it! You walked through the wet floor with your cart with no falling and no pain.

You arrive at the bread aisle and smell the wonderful smell of bread as you are walking through the bread aisle. You look at all the different varieties of bread. White, whole wheat, multi grain, oat, whole grain, sourdough. There are so many choices but you choose the bread you normally choose and put it gently into your cart.

You are now done shopping and ready to go to the cashier to pay for your items. It was a great day walking around the supermarket and you especially feel really proud of yourself of how you handled the wet floor section without having the fear of falling.

APPENDIX N
INSTRUCTIONAL BOOKLET FOR INTERVENTION GROUP (IG)

INSTRUCTIONS GUIDE FOR GREI (Guided Relaxation and Exercise Imagery) CD

BEFORE YOU BEGIN LISTENING TO THE CD PLEASE GET INTO A COMFORTABLE POSITION (e.g., lying down on a bed, sitting on a comfortable chair), DIM THE LIGHTS, CLOSE YOUR EYES AND RELAX!

ENJOY!

WEEK 1

Day 1:

1. Please listen to **TRACK 1** NOW for introduction.
2. After listening to track 1, please get into a relaxed position and please go to **TRACK 2** for a guided relaxation session.
3. After listening to **TRACK 2**, please go to **TRACK 4** for your first guided imagery session.
4. After you have finished listening to **TRACK 4**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

Day 2:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 3** for a guided relaxation session.
2. After listening to **TRACK 3**, please go to **TRACK 5** for your 2nd guided imagery session.
3. After you have finished listening to **TRACK 5**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

WEEK 2

Day 3:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 3** for a guided relaxation session.
2. After listening to **TRACK 3**, please go to **TRACK 6** for your 3rd guided imagery session.
3. After you have finished listening to **TRACK 6**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

Day 4:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 2** for a guided relaxation session.

2. After listening to **TRACK 2**, please go to **TRACK 7** for your 4th guided imagery session.
3. After you have finished listening to **TRACK 7**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

WEEK 3

Day 5:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 2** for a guided relaxation session.
2. After listening to **TRACK 2**, please go to **TRACK 8** for your 5th guided imagery session.
3. After you have finished listening to **TRACK 8**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

Day 6:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 3** for a guided relaxation session.
2. After listening to **TRACK 3**, please go to **TRACK 8** for your 6th guided imagery session.
3. After you have finished listening to **TRACK 8**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

WEEK 4

Day 7:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 3** for a guided relaxation session.
2. After listening to **TRACK 3**, please go to **TRACK 9** for your 7th guided imagery session.
3. After you have finished listening to **TRACK 9**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

Day 8:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 2** for a guided relaxation session.
2. After listening to **TRACK 2**, please go to **TRACK 10** for your 8th guided imagery session.
3. After you have finished listening to **TRACK 10**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

WEEK 5

Day 9:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 2** for a guided relaxation session.
2. After listening to **TRACK 2**, please go to **TRACK 10** for your 9th guided imagery session.
3. After you have finished listening to **TRACK 10**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

Day 10:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 3** for a guided relaxation session.
2. After listening to **TRACK 3**, please go to **TRACK 11** for your 10th guided imagery session.
3. After you have finished listening to **TRACK 11**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

WEEK 6

Day 11:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 3** for a guided relaxation session.
2. After listening to **TRACK 3**, please go to **TRACK 12** for your 11th guided imagery session.
3. After you have finished listening to **TRACK 12**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

Day 12:

1. After listening to track 1, please get into a relaxed position and please go to **TRACK 2** for a guided relaxation session.
2. After listening to **TRACK 2**, please go to **TRACK 13** for your 12th guided imagery session.
3. After you have finished listening to **TRACK 13**, please write today's date and what tracks you listened to in the GREI CD CHECKLIST.

CONGRATULATIONS! YOU HAVE NOW COMPLETED THE GREI CD. IF YOU LIKE, YOU MAY LISTEN TO THE CD NOW AS YOU PREFER! THANKS AGAIN!

APPENDIX O
CHECKLIST FOR INTERVENTION GROUP

GREI (GUIDED RELAXATION AND IMAGERY) CD CHECKLIST

PLEASE CIRCLE ONE AND FILL IN THE BLANKS

I LISTENED TO TRACK 1 (ONE) YES / NO
TODAY'S DATE ___/___/___

WEEK 1:

DAY 1 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

DAY 2 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

WEEK 2:

DAY 1 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

DAY 2 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

WEEK 3:

DAY 1 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

DAY 2 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

WEEK 4:

DAY 1 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

DAY 2 I LISTENED TO TRACK ___ FOR RELAXATION
I LISTENED TO TRACK ___ FOR IMAGERY
TODAY'S DATE ___/___/___

WEEK 5:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ FOR RELAXATION I LISTENED TO TRACK ___ FOR IMAGERY TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ FOR RELAXATION I LISTENED TO TRACK ___ FOR IMAGERY TODAY'S DATE ___/___/___
WEEK 6:	
<u>DAY 1</u>	I LISTENED TO TRACK ___ FOR RELAXATION I LISTENED TO TRACK ___ FOR IMAGERY TODAY'S DATE ___/___/___
<u>DAY 2</u>	I LISTENED TO TRACK ___ FOR RELAXATION I LISTENED TO TRACK ___ FOR IMAGERY TODAY'S DATE ___/___/___

CONGRATULATIONS! YOU HAVE FINISHED THE GREI CD. PLEASE USE THE SPACE BELOW TO WRITE ANY COMMENTS/QUESTIONS.

APPENDIX P
TRUST AGREEMENT LETTER

Trust Agreement Letter

I, _____, have agreed with the researcher to follow the instructions from the instruction booklet and use the AUDIO CD, for TWO times a week, only once per day for SIX weeks.

Date

Participant's Signature

Researcher's Signature