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The Effects of the "Get Off Your Rocker" Exercise Class on Balance

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THE EFFECTS OF THE "GET OFF YOUR ROCKER"

EXERCISE CLASS ON BALANCE

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This Scholarly Project, submitted by Heather Bethard, Trish Magee, Susie McGarry, and Sarah McGuire in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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PERMISSION

Title	The Effects of The "Get Off Your Rocker" Exercise Class on Balance
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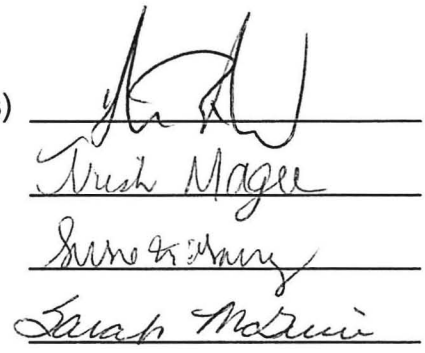
Signature(s) 

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ABSTRACT

The purpose of this study was to determine if the six-week "Get Off Your Rocker" balance exercise class, promoted by HealthSouth®, had a significant effect on balance in the geriatric population. If proven to be effective, this class could be an additional tool for physical therapists to utilize to aid in improving a patient's balance.

A total of 22 subjects volunteered to participate in this study. They were randomly divided into two groups: a control group (n=10, 8 females and 2 males) and an exercise group (n=12, 8 females and 4 males). All subjects were high functioning and were found to be at a low risk for falls as determined by the Berg Balance Measure. The age of subjects ranged from 60-87, with a mean age of 74.77.

The study included an initial and final evaluation using the Berg Balance Measure, Timed "Up and Go" Test (TU&GT), the Functional Reach Test, and ankle range of motion measurements. Following the initial assessment, the control group was instructed to continue their normal daily activities during the following six-week period. The exercise group participated in the balance exercise class three times per week for six weeks. The exercises they performed included single leg stance activities, Swiss Ball exercises, tandem walking, and activities that challenged the base of support. Following the six-week period, the

Berg Balance Measure, TU&GT, Functional Reach, and ankle range of motion results were again obtained.

An Analysis of Covariance was used to compare the control group to the exercise group using scores from the Berg Balance Measure, TU&GT, Functional Reach, and ankle range of motion measurements. An alpha level of $p=0.05$ was used to determine significance.

Following six weeks of exercising, there was a significant difference between the control group and the exercise group on two tests [$F(1,19) = 6.092$, $p=0.023$ for the Berg; $F(1,19) = 4.997$, $p=0.038$ for the Functional Reach], with the exercise group demonstrating an increase in scores. There was no significant difference found between the groups for the TU&GT [$F(1,19) = 0.442$, $p=0.514$] or for ankle range of motion measurements [$F(1,19) = 0.110$, $p=0.743$ for ankle dorsiflexion with knee extension; $F(1,19) = 0.491$, $p=0.492$ for ankle dorsiflexion with knee flexion].

This six-week balance exercise class significantly improved scores on the Berg Balance Measure and the Functional Reach Test. The "Get Off Your Rocker" balance exercise class can be an effective tool for physical therapists to use for balance training and promoting wellness among the elderly.

CHAPTER I

INTRODUCTION

The population of adults over the age of 65 is rapidly increasing, and is expected to grow in the future as the baby boomer population ages. According to the 2000 United States Census, there are nearly 35 million adults over the age of 65 in the United States.[1] It is expected that this population will increase to over 62 million by the year 2045. As a person ages, there is a decline in postural control mechanisms that regulate balance.[2] This deterioration in balance and postural control is associated with an increased risk of falls, which is a leading cause of injury and mortality in the elderly population.[3,4] Maintaining balance involves the integration of information from the visual, vestibular, somatosensory, and musculoskeletal systems.[5,6] With the aging process these systems may experience deterioration, and the ability to interpret multiple sensory inputs is impaired.[7] These declines thus lead to a decrease in balance and an increased risk for falls.

In the practice of physical therapy there are several techniques used to improve balance and postural control in the elderly. These consist of strengthening programs, alternative therapies (Tai Chi, yoga, country line dancing), and traditional balance training exercises. Research has found varying results concerning the effectiveness of different balance training methods in this population.[8-12] This study will focus on the efficacy of the "Get Off Your Rocker"

balance exercise class as another tool for improving balance in the elderly.

PROBLEM STATEMENT

With the current and projected growth trends of the elderly population in the United States, physical therapists are in need of effective methods to treat and prevent balance deficits. A group exercise program could promote wellness as well as improve compliance and adherence due to the social interactions among the participants. Furthermore, group therapy is a cost-effective means of treating a large group of individuals.

PURPOSE

The purpose of this study is to determine if the participants demonstrate significant improvements in balance upon completion of the six-week "Get Off Your Rocker" balance exercise class. If successful results are observed, this type of balance class can be an additional tool for physical therapists in training balance.

SIGNIFICANCE OF STUDY

Research has shown that balance exercise training plays a significant role in improving postural control. This study is significant because it provides pertinent information regarding the effects of the "Get Off Your Rocker" balance exercise class on postural control in the geriatric population.

RESEARCH QUESTIONS

1. Is there a significant change in the results of the Berg Balance Measure, Timed "Up and Go" Test (TU&GT), Functional Reach, and ankle range of motion measurements after the six-week study?

2. If a significant change is found, is there a difference between the exercise and control groups?

HYPOTHESES

The null hypothesis is that a six-week balance exercise class will have no effect on postural control. The alternate hypothesis is that a balance exercise class will have a significant effect on postural control.

CHAPTER II

LITERATURE REVIEW

BALANCE IN THE ELDERLY

Approximately one-third of community-dwelling people over age 65 experience a fall each year.[3,13,14] Falls are documented as a leading cause of injury and mortality, particularly among the elderly,[3] and are associated with decreased balance.[4] During the aging process there is a significant deterioration in the postural control mechanisms that regulate balance.[2] Some of the detrimental effects of falls include soft tissue trauma,[14] fractures (hip,[3,13-15] wrist,[13] humerus,[13] and ankle[13]), increased bone demineralization,[14] and decreased circulation.[14] Hip fractures are among the more serious of these effects due to the likelihood of limiting physical activity. Unfortunately, the majority of people who experience a hip fracture do not regain their premorbid level of function.[13] Within a year of sustaining a hip fracture, approximately 20% of people die and another 20% become institutionalized.

There are a variety of reasons that falls occur, including both extrinsic and intrinsic risk factors.[3,13,14] Extrinsic risk factors are those in the environment that may be a potential hazard to an individual. Some examples of extrinsic factors include sliding carpet, stairs, pets, slippery surfaces, poor lighting, insufficient support devices, and inadequate footwear.[14] In comparison, intrinsic risk factors are those that are characteristic of the health of the individual. Examples of

intrinsic factors are such things as visual insufficiency,[3,13-15] vestibular abnormalities,[14] gait deficits,[3,14] cognitive impairments,[3,15] and musculoskeletal disturbances,[3,15] all of which may be neurologically based. A combination of extrinsic and intrinsic factors can lead to a loss of balance, which is a leading cause of falls in the elderly.

Balance is defined as the stability produced on each side of a vertical axis.[5] In the human body, postural stability is dependent on the positional control of body parts by skeletal muscles. In normal alignment, the center of gravity is maintained over the base of support for optimal safety and function. Maintaining balance is the result of a highly integrative process that involves several afferent and efferent pathways in order to achieve static and dynamic equilibrium.[16] If the integrative forces are not sufficient to balance and align the human body, the center of gravity will be displaced outside the base of support, resulting in a loss of balance.

AGE-RELATED CHANGES

VISUAL SYSTEM

Maintaining balance requires the integration of visual, vestibular, somatosensory, and musculoskeletal information.[7] With the aging process the ability to interpret multiple sensory inputs is impaired, thus leading to a decrease in balance and an increased risk for falls. The visual system is an important component in balance as it provides an individual with information related to the placement of objects in the environment, the type of surface on which motion will take place, and the position of body parts in relation to the environment.

Accommodation,[17-19] static and dynamic acuity,[17-20] contrast sensitivity,[17] light and dark adaptation,[18-20] and peripheral vision[17,18] are all critical components of visual function that characteristically decline with the normal aging process.[17]

Accommodation is the process of the lens adjusting, which results in visual acuity, or sharpness.[18] Static acuity is apparent when the eye is focusing on an object at rest, whereas dynamic acuity is present when focusing on an object in motion. During the aging process, accommodation, and therefore visual acuity, may decline due to loss of flexibility of the lens, reduction of anterior chamber size, and decreased strength of the ciliary muscles.

The ability to distinguish between adjacent light and dark objects is contrast sensitivity.[21] Dark objects are characterized by a high frequency whereas light objects exhibit a low frequency. Contrast sensitivity is measured by the minimum difference between frequencies that can be observed. With increased age, the pupil diameter decreases, therefore reducing the amount of light that reaches the retina.[22] The retina of an individual over the age of 60 receives only one-third the amount of light that a typical 20-year old receives. This is why elderly individuals require increased amounts of light in order to distinguish between objects of different contrast.[18]

Light and dark adaptation is the ability to adjust to changes in illumination.[20] Dark adaptation is a process where the eyes are sensitive to darkness after being in light, and light adaptation is the converse. Normal adaptation times are between two and four minutes, but the chemical process

may take up to 20 minutes to complete. Due to the chemical and neural changes that occur in the normal aging process, these times often become increased.

Peripheral vision is the area of the visual field located away from the center point of focus.[18] This size of the visual field is reduced in the aging process due to a loss of receptors, the eye sinking into the orbit, and ptosis.

Several studies have been performed to examine the effects of vision on balance in the elderly. Because the amount of postural sway is directly related to balance,[2] the degree of postural sway is often a subject of study. Increased postural sway may be due to related declines in visual acuity[23] such as near vision and decreased peripheral vision.[17] Klein et al[23] reported that individuals over age 60 who exhibit poor visual acuity and poor sensitivity to light are more likely to sustain two or more falls in a year, which could result in a hip fracture. On the contrary, Lord et al[21] performed a study and found that poor contrast sensitivity was more detrimental than decreased visual acuity in people who have experienced falls compared with those who have not. However, it has been found that both poor visual acuity and contrast sensitivity are related to increased sway on a dynamic surface.[7,21] In comparison, although visual impairments are also commonly present in younger individuals, they have an increased ability to compensate with mechanisms such as proprioceptive input and postural strategies.[22] Because the elderly may lack the sharpness of these balance mechanisms, a decline in vision may be associated with traumatic events, such as falls, which may lead to a decrease in quality of life and independence.

VESTIBULAR SYSTEM

The vestibular system collaborates with the visual and somatosensory systems to maintain balance.[17,22] It consists of three interacting mechanisms including the peripheral sensory, central processing, and motor control components.[17]

The sensory component, located in the inner ear, includes the semicircular canals and otolith organs.[17] The hair cells located in the semicircular canals and otolith organs are responsible for detecting head movement and its spatial orientation. In the normal aging process, several changes to the vestibular system occur, including a decrease in number of hair cells[17,18,20,22,24,25] and peripheral neural fibers.[20,24]

The central processing component, located in the pons and cerebellum, receives and processes signals from the inner ear.[17] These signals combine with information from the proprioceptive and visual systems, and then a message is sent to the motor control component.

The motor control component consists of the ocular muscles and spinal cord, which generate a person's response to stimuli by way of the vestibulo-ocular or vestibulospinal reflexes.[17] The vestibulo-ocular reflex is necessary for maintaining visual stability while the head is in motion. Each time the head moved slightly, a visual image would change if this reflex was not present. With increased age, the vestibulo-ocular reflex undergoes numerous changes. For example, saccadic eye movements experience increased latency, and smooth pursuit and optokinetic nystagmus diminish.

The vestibulospinal reflex, also known as the righting reflex, influences muscles in the neck, trunk, and limbs.[17] This reflex is responsible for compensatory body movements that maintain balance when an individual sustains a loss of stability. With the latency of the central processing component and decreased muscle strength associated with increased age, this reflex is often impaired.

Numerous studies have demonstrated that an impaired vestibular system alone is not responsible for increased postural sway in the elderly. However, these same studies have found sway to be markedly increased when a visual and/or somatosensory impairment is also present.[22,25,26,27] Alexander[25] found that head stabilization plays an important role of the vestibular system. Orientation of the otolith organs and semicircular canals changes as the head is flexed, extended, or rotated resulting in an impairment in vestibular feedback for maintaining postural control. Therefore, an individual with poor head control may have difficulty in sustaining balance.

SOMATOSENSORY SYSTEM

Somatosensory inputs are important components of balance as they consist of joint and muscle proprioceptors and cutaneous sensations from body parts that are in contact with a supporting surface.[5] The proprioceptive input, arising from joint mechanoreceptors, muscle and tendon receptors, and pressure receptors in the feet provide important sensory information relating to balance.[17] The cutaneous sensations have their own receptors which provide information about touch, pressure, heat, cold, and pain.[18]

With the aging process, proprioception demonstrates a decline as cutaneous vibratory sensation and lower extremity joint proprioception sense decrease.[17,22,28] Evidence has shown that a loss of cutaneous receptors is common and an individual may require a higher threshold of stimulation in those remaining receptors.[7,18] In addition, studies have found that joint position sense in the knee and metatarsophalangeal joint declines with age.[25] As a result of these changes, burns commonly occur when a person does not recognize an increased temperature,[18] and falls often occur when touch receptors on the feet[7,18] and ankle proprioceptors[7] do not function correctly. The amount of body sway in elders has been directly linked to the amount of somatosensory input received by the ankles. Several studies have found that those without a history of falls were more likely to correctly compensate for conflicting information from the visual, vestibular, and ankle proprioceptive inputs.[7,29] Proprioceptive input is considered to be the most important factor in controlling ankle sway and maintaining postural stability.[27]

MUSCULOSKELETAL SYSTEM

Several postural strategies of the musculoskeletal system are involved in maintaining postural control.[5] These include the ankle, hip, and stepping strategies. Typically the ankle strategy is utilized when small disturbances are sensed. The ankle strategy involves shifting the center of gravity anteriorly with use of the dorsiflexors or posteriorly with use of the plantarflexors. The hip strategy is utilized with greater displacements of the center of gravity. The hip flexors fire in order to shift the center of gravity anteriorly, whereas the hip

extensors fire to shift the center of gravity posteriorly. The stepping strategy is used when the ankle and hip strategies are no longer adequate to maintain balance. In this strategy, a step is taken in the direction of the displacement in order to realign the base of support under the center of gravity. When these three postural strategies reach the limits of stability, the head, trunk, and arms move in an attempt to help maintain balance.

As an individual ages, a decline in muscle strength is evident,[16,17,22,30,31] with the greatest decrease noted in the lower extremity muscle groups.[17] This decline in strength can be attributed to three major factors: biological changes, disuse atrophy, and medications.[31]

Biological changes include a decreased oxidative capacity of the muscle fibers,[31] increased amounts of connective tissue,[16,22] and alterations in muscle fibers.[16,30,31] The decreased oxidative capacity of muscle fibers is a result of a reduction in number and size of mitochondria as well as reduced enzymatic activity.[31] Increased connective tissue amounts in aging muscle, which may be a result of collagen cross-links, result in decreased flexibility, or stiffness.[16,22] Alterations in muscle fibers include a decrease in the number,[16,30,31] size,[16] and peak torque[3,14] of Type II (fast-twitch) muscle fibers. In a study by Kauffman,[16] an isokinetic evaluation found that individuals with a history of falls generate less peak torque than those without a history of falls. More specifically, the muscles that generally show this decline are anti-gravity muscles such as the quadriceps,[16,17,30] hip extensors,[16,17] and ankle dorsiflexors.[16,17,22] Adjusting the

center of gravity in line with the base of support to maintain balance may be more difficult with a decline in muscle strength and joint flexibility.[17]

Disuse atrophy typically results in a reduction in muscle weight and number of sarcomeres as well as atrophy of Type II fibers.[31] For these reasons, it is important to maintain an active lifestyle and participate in a regular exercise regime.

Chronic use of certain medications result in muscular changes within the body.[31] For example, diuretics routinely used for cardiovascular conditions often cause a depletion in electrolytes. Corticosteriods, commonly used for chronic obstructive pulmonary disease and arthritis, exemplify catabolic effects by breaking down muscle tissue. Both the depletion of electrolytes and catabolic effects result in muscle weakness.

During the aging process, skeletal changes also occur that affect postural stability.[17] Spinal degeneration, which includes disc space narrowing and osteophyte formation, may lead to an abnormal curvature of the spine, or scoliosis. In individuals over 75 years of age, scoliosis is significantly associated with increased postural sway. A kyphotic posture, which may be due to structural changes in the spine or to adaptive responses to instability may also alter the body's balance threshold and shift the center of gravity forward past the base of support.

MEDICATION-RELATED EFFECTS

Throughout the last several years the multifactorial etiology of falls has been thoroughly evaluated.[32] An important factor to consider when studying falls

in the elderly is the prevalence of medication use. The increased risk of falling may be associated with medication use due to age-related declines in liver metabolic function, decreased renal capacity, psychomotor impairment from psychotropic medications, and the side effects associated with polydrug treatments.

Multiple studies have focused on the relationship between falls and medication use in nursing homes.[33] The average nursing home resident in the United States uses six different medications, and 10 or more different drugs are used by approximately 20% of the residents. Leipzig et al[34] found that patients taking three or more medications are at an increased risk of recurrent falls compared to patients who take less medications, which statistically places the average nursing home resident at an increased risk of falling. Psychotropic medications have found to be an important cause of falls in nursing homes [13,35] as between 45 and 55% of residents receive this type of medication.[35] Thapa et al[35] found that 36% of falls in nursing homes may be associated with psychotropic drug use. Several researchers also report that community dwelling individuals who use psychotropic medications have a 1½ - 3 fold increased rate of falls.[13,35] Therefore, it is important that health care providers use alternative forms of therapy if possible.

Several studies have been performed to determine the risk of falling with certain classes of medications. Unfortunately, many inconsistencies have been reported due to the difficult nature of the study and the external factors that must be controlled for. Antidepressants have been found to be associated with falls,

and as a result, an increase in hip fractures.[36] Sedation is often a side effect of antidepressants that may lead to psychomotor retardation and an increased risk for falling.[37] The risk of a hip fracture was greatest in individuals who had started using antidepressants in the previous 90 days.[36] The research regarding the association between cardiac medications and falls is poor. Some studies have found a significant increased risk for falls amongst cardiac drug users, and many studies have not. Gales and Menard[38] found that the use of digoxin, a cardiac medication, increased the risk of falls by 90%. Nitrates and calcium antagonists have also been associated with falls.[13] Nitrates may be associated with falls as sublingual nitroglycerin causes a large drop in systolic blood pressure, especially in individuals with a history of falls.[39] Therefore, it is important for health care professionals to monitor, regulate, and recognize potential side effects of these medications.

BALANCE TRAINING

As previously mentioned, the high occurrence of falls and the potential injuries associated with falling in older adults are evident.[1-3,6] The changes that occur in bodily systems with aging put the senior population at a greater risk for falling, many times causing an injury that results in loss of function and dependence on others. Falls in the elderly take their toll physically, financially and emotionally. As a result, recent research has been directed towards finding effective methods of retraining balance and coordination in order to prevent falls in the elderly.

When retraining balance in older adults, it is important to consider different principles of balance training. Motor control and motor learning concepts and theories, as well as the results of past research, serve as guides to planning a balance-training program. It is also important to challenge the changes in bodily systems including neuromuscular, skeletal, visual, and vestibular that occur with aging.[1-3,6] When changes and impairments are considered, a program that retrains balance and challenges the individual at an appropriate level can be designed.

Concepts of motor control suggest that balance training be approached by following a task-oriented approach.[6] Balance and coordination are components of motor control that are necessary in safely performing functional skills of daily living.[40] Whether retraining or preventing balance impairments, a training program should involve developing task-specific strategies of balance and coordination that can be performed in a variety of functional motor tasks in different environments.[6,40,41] O'Sullivan and Schmitz[41] suggest that when training balance and coordination for function, it is important to keep in mind the stages of motor control. These training stages include initial mobility, stability, controlled mobility, and skill. They progress from movements requiring a large base of support and lacking coordination (mobility level) to highly coordinated movements with little or no support that can be adapted to changing environments (skill level). Therapeutic activities from the appropriate level should be selected for each individual based upon his or her needs and impairments. For community-dwelling older adults who are not at a high risk of

falling, more advanced activities from the controlled mobility and skill levels may be most appropriate. Another key component of balance to keep in mind is the development and maintenance of effective postural strategies.[6,11,12] These include the ankle, hip, and stepping strategies that are responsible for maintaining the center of mass in a stable position in response to external postural perturbations as well as volitional movements.[6]

In addition to motor control concepts, is it also important to consider the theories of motor learning when implementing a balance-training program. The basic concept is that feedback and practice are essential when retraining a motor task or skill.[41] Feedback can be visual or verbal information that one receives intrinsically or extrinsically regarding his or her performance. It is given to help correct errors and improve performance. If balance and coordination skills are to be properly retrained or developed, repeated practice of those skills is necessary.[40,41] O'Sullivan and Schmitz[41] suggest that skill retention is best when practice order is varied and skills are practiced in varying environments and situations.

Research has been conducted with the goal of finding effective programs for improving balance in the elderly. Previous studies have investigated the effects of different programs involving different types and combinations of strength and flexibility training and static and dynamic balance training.[8-12] Judge et al[8] found that a program involving a combination of exercises significantly improved postural sway in single leg stance and knee extension force as compared to a flexibility training group. However, repeated-measures analysis

demonstrated no significant difference in improvement of single leg stance between the two groups. The intervention for the combined exercise group involved moderate resistance training, walking, trunk and lower extremity stretches, postural control and mobility exercises, and simple Tai Chi movements three times per week for six months. The flexibility-training group performed the stretching, postural control, and Tai Chi exercises once a week, beginning 12 weeks into the study. The study's authors suggested that muscle control rather than muscle force may be more important in controlling single-leg stance.[8] Other studies that implemented resistance training programs with older adults also showed significant lower extremity strength gains, but failed to result in improved performance in functional skills such as standing balance and sit-to-stand rise time.[9,10]

Some researchers have concentrated their efforts into addressing more specific components of balance including coordination and sensory systems such as visual, vestibular, and somatosensory systems.[11,12] Shumway-Cook et al[11] trained subjects in various balance exercises that focused on postural alignment, use of the senses for postural orientation, coordinated movement strategies, and integration of sensory and motor strategies in maintaining posture and balance in functional activities. The subjects in the study demonstrated significantly improved scores on balance and mobility measures following the eight to twelve week trial. Hu and Woollacott[12] also found favorable results with elderly subjects who underwent a multisensory training program on a computerized balance platform that challenged the visual, vestibular, and somatosensory systems. The

balance-training subjects showed improvements in postural stability in five out of eight testing conditions, and increased single-leg stance time as compared to those in the control group. The authors of both studies concluded that although their methods of sensory training were effective, it is best to treat individuals with balance deficits individually according to a thorough assessment of all systems.[11,12]

Both research and a strong theoretical framework present many successful guidelines for potential activities in a balance-training program for a population of older adults. Research has applied different theories of motor control and motor learning in developing methods of effective balance training. A common goal in creating a balance training program is to develop an exercise regimen that applies theories of training in a practical and functional program that older adults will enjoy.

When designing exercises for balance training it is important to keep in mind one of the key components of standing balance, effective postural strategies.[6,11,12] It is necessary to have efficient and effective ankle, hip, and stepping strategies in order to maintain upright posture in static and dynamic functional activities. It has been suggested that the strategies can be learned and become more efficient with repeated practice.[42] In order to train and improve the postural strategies, it is necessary for the center of mass to travel outside the base of support. As one performs activities that cause sway of the center of mass, coordination of the muscles involved with the ankle and hip strategies is practiced. For example, activities such as reaching for objects, catching and

throwing a ball while maintaining unilateral and bilateral stance, and leaning forward and backward with support all present a challenge to maintaining stability.[41] The natural environment is filled with everyday challenges such as narrow walkways and weather hazards around which to navigate. These obstacles require the use of coordination and a narrowed base of support, which can be practiced with activities such as side-stepping and tandem walking.[41] Activities involving unilateral stance are also essential to include because many functional activities such as gait and stair-climbing require single-limb stance. Approximately 39% of the gait cycle is spent in single-limb stance, requiring proper balance.[6] Although research has not placed a great deal of importance on it, it is also important to improve sitting balance in a training program. Performing activities while seated on a Swiss ball provides the trunk muscles with postural control and balance challenges.[41]

As previously mentioned, advancing age can cause impairments in the sensory systems which often times affect balance. However, the results of several studies have shown that challenging the visual, vestibular, and somatosensory systems cause improvements in balance and postural control.[11,12] It is important to provide the visual system with depth perception and coordination challenges in order to aid older adults in successfully encountering obstacles in their environment.[43] Examples of activities that challenge the vestibular system include incorporating head movements during gait activities and walking on uneven surfaces.[41] Walking on a variety of surfaces such as foam, carpet, and tile provide practice for the somatosensory system in training

postural control mechanisms.[41,43] Activities such as tossing and catching a ball, stepping through, over, or on targets, and other activities that involve hand-eye coordination and visual acuity are appropriate.

While it is essential to incorporate all of the discussed aspects necessary for comprehensive balance training, it is also important to administer the exercises in a method that promotes adherence and interest for the elderly population. A group exercise setting is very beneficial as it facilitates social interaction as well as being an economical and efficient method of therapeutic exercise. The American College of Sports Medicine recommends implementing group exercise programs in order to enhance adherence to exercise.[44] In addition, research has shown that practicing in dyads or groups as opposed to individual training results in more effective motor learning.[45] Shea, Wulf, and Whitacre[45] found that individuals who alternated between physical, observational, and dialog practice with a partner demonstrated significantly greater improvements in performance of balance tasks as compared to those who practiced individually. The possible benefits of dyad training include observing another performer, having the opportunity to rest, increasing motivation, and encouraging individual goal setting.[45,46] Group balance exercise training offers many benefits and would be appropriate to a physical therapy setting.

To summarize, there are some basic guidelines to follow when planning a balance-training program for older adults. Progressing exercises appropriately involves beginning with static activities and providing a large base of support and advancing to dynamic, whole-body activities while gradually decreasing the base

of support.[6,40,41] Repetition and feedback are essential for learning, and most importantly, activities need to be functional.

CHAPTER III

METHODOLOGY

Prior to the initiation of the study, authorization and approval was obtained from the University of North Dakota Institutional Review Board (IRB) for the use of human subjects (Appendix A). HealthSouth® of Grand Forks, North Dakota was in full cooperation and agreement to develop, instruct, and host the "Get Off Your Rocker" classes for this study. The researchers informed the individuals participating in the study that participation was strictly voluntary, and although their attendance was mandatory at the classes, they were free to drop out at any time before the final data was collected. Following preliminary information regarding the specifics of the study, all subjects were free to address any questions and concerns they had related to their participation in the study. Individuals who agreed to voluntarily participate were then asked to sign the information and consent form (Appendix B). Subjects were also asked to fill out a general health questionnaire to inform the researchers of any major medical complications and current prescription medications (Appendix C).

SUBJECTS

A sample of convenience of volunteer subjects, 60 years of age or older, was recruited by the Fitness Director at HealthSouth® through advertisement in the Grand Forks Herald®, HealthSouth® members' newsletter, and the newsletter

for the senior citizens of Grand Forks, ND and East Grand Forks, MN. The following criteria must have been met by individuals to be included in the study: be 60 years of age or older, live and ambulate independently without the use of assistive devices, obtain a minimum score of 45 on the Berg Balance Measure,[47] have a resting blood pressure of 160/90 mmHg or less (as noted by researcher's blood pressure screen), and not be a current participant of the "Get Off Your Rocker" class. Immediately following initial screening (including the Berg Balance Measure, the TU&GT, the Functional Reach Test, and ankle dorsiflexion measurements), blood pressure was re-measured and could not exceed 200/100 mmHg. The researchers determined that three individuals were unable to participate in the study due to high blood pressure and one subject was unable to participate due to not meeting the minimum Berg Balance Measure score.

Twenty-two subjects (6 males and 16 females, ages 60-87, with a mean age of 74.77) met the criteria and were randomly assigned into two groups: an exercise group (n=12, 4 males and 8 females) and a control group (n=10, 2 males and 8 females). The exercise group, led by HealthSouth® fitness instructors, participated in the 30-minute "Get Off Your Rocker" class three times per week for six continuous weeks. Instructors monitored each subject's blood pressure once per week to ensure that it did not exceed 200/100 mmHg. Subjects were encouraged to attend every class session. Both the exercise and control groups were asked to continue with their normal daily activities and to refrain from adding any exercise changes during the six-week study, with the exception of the "Get Off Your Rocker" class for the exercise group. All subjects

were required to participate in testing procedures conducted by the researchers, both before the initiation of the six-week class and immediately following. The "Get Off Your Rocker" class and the testing procedures were held at HealthSouth® in Grand Forks, ND. Following completion of the class the subjects in the exercise group were also asked to answer a short questionnaire regarding their experience in the class (Appendix D).

PILOT STUDY

Prior to the initial testing, a pilot study was conducted to determine intra-rater (test-retest) reliability of the researchers for the specific testing procedure that they would be conducting in the study [the Berg Balance Measure, the TU&GT, and active assisted range of motion (AAROM) for ankle dorsiflexion]. The participants were tested two times with at least 24 hours between tests. The data to calculate the intra-rater reliability was run on the SPSS Version 10.0.

The Berg Balance Measure pilot study consisted of a sample of n=7, ranging in age from 65-87 with a mean of 76.14. The original sample size was n=9; however the scores of two subjects were eliminated due to decreased willingness to participate and an uncharacteristic performance compared to initial screening. The Pearson r value for the Berg Balance Measure was .9370 and the Intra-class Correlation Coefficient (ICC) was .9246, thus demonstrating intra-rater reliability. The TU&GT pilot study consisted of a sample of n=10, ranging in age from 23-52 with a mean age of 34.6. The Pearson r value showing intra-rater reliabiltiy for the TU&GT was .9993 and the ICC was .9992. The AAROM pilot study consisted of a sample of n=9, ranging in age from 65-87 with a mean

of 77. This reliability was found with measurements taken on the left ankle with the knee extended. The intra-rater Pearson r value for the AAROM was .9604 and the ICC was .9125. A pilot study was not conducted for the Functional Reach due to an established test-retest Pearson r of .89 and an ICC value of .98.[48]

INSTRUMENTATION

All subjects were initially screened using the Berg Balance Measure (Appendix E). As a safety precaution to continue with the testing, subjects had to receive a score of 45 or greater, which is a score specific in identifying those persons who are at a low risk for falling.[47] This test was again administered at the completion of the six-week study. The Berg Balance Measure consists of 14 maneuvers involved in common functional tasks that require maintenance of balance. Each item is graded on a five-point ordinal scale (0-4), with a possible total of 56 points. As a balance assessment tool for in the elderly population, the Berg has been found to be valid and reliable, with an overall inter-rater reliability of .98 and intra-rater reliability of .99, demonstrating a very strong degree of agreement.[49]

Subjects who scored 45 or greater on the Berg were able to continue with the study and underwent additional initial and final assessments including the TU&GT, ankle AAROM measurements, and the Functional Reach Test. The TU&GT measures the time it takes a subject to rise to standing from a standard armchair, walk three meters, turn 180 degrees, walk back to the chair, and return to the original seated position.[47] The TU&GT was used in the study to test

dynamic balance for transferring from sit to stand and stand to sit, turning, and ambulating. This test has been found to have an extremely high inter-rater reliability of .99.[47]

Ankle AAROM measurements were also taken to aid in the assessment of balance in the subjects. Research has found that individuals with decreased ankle ROM may demonstrate altered movement patterns, which may in turn compromise balance, thus limiting functional activities such as gait.[48] In the present study, two separate bilateral measurements were obtained. The first measurement was taken with the subject supine, knees extended and maleoli extending off the plinth. The other measurement was obtained with the subject short sitting with knees flexed over the edge of the plinth and feet unsupported. Two researchers were used to assess AAROM. The subject was asked to actively assist with ankle dorsiflexion while one researcher maintained ankle position and proper alignment. The other researcher measured the ankle motion with a 360-degree goniometer using exposed bony landmarks.[50] Goniometric reliability has been established to be relatively high for measurements of dorsiflexion, with .92.[48]

The Functional Reach Test was used for assessment in this study to measure each subject's margin of stability during voluntary forward maximal reach, which can be incorporated into numerous functional daily activities.[5,47,51] Functional Reach was measured using a leveled yardstick secured to the wall at the approximate height of each subject's left shoulder. Each subject was asked to remove socks and shoes and assume a position of normal, relaxed stance

while his or her feet were traced on a sheet of white paper [as to assume the identical position or base of support (BOS) for the post-testing]. Each subject was then instructed to raise his or her left arm with fingers extended until parallel with the yardstick. The position of their distal third phalange was recorded. The subject was then asked to reach as far forward as able without losing balance and without touching the wall. Again the position of the distal third phalange was recorded. The researcher used a ruler to intersect the yardstick at the most advanced position of the third phalange to obtain accurate readings. Each subject was given three trials. Functional Reach was recorded as the mean difference between the two positions. For the post-test assessment following the six-week class, each subject was instructed to assume the same stance position (BOS) as he or she had during the first testing procedure, within the traced lines on the white sheet of paper. The Functional Reach Test was found to have high inter-rater reliability of .98.[48]

TRAINING PROCEDURES

"GET OFF YOUR ROCKER" BALANCE CLASS

The "Get Off Your Rocker" class is a low intensity, low impact class that emphasizes single-leg stance activities, Swiss ball movements, tandem walking, and various activities that challenge the BOS. These are typical exercises that would be incorporated into physical therapy treatment programs. There were two "Get Off Your Rocker" balance classes that were held at separate times to accommodate for the number of subjects, and ensuring safety of the subjects. The classes were identical to each other in the exercises that were performed

each session. The exercise group participated in one of the two classes that met for 30 minutes three times per week for six continuous weeks. Every other class period, the exercises in each class alternated in order to ensure variety and to keep the interest of the subjects. An assortment of equipment was used for the balance training activities including: therapeutic balls, tightropes, floor ladders, Zoom Balls, mirrors, balloons, blocks, Poly Dots, nets, aerobic steps, pillows, and assorted sized balls. Pictures along with descriptions of the exercises and exercise equipment are included (Appendix F). All sessions were led by one of three trained aerobic instructors at HealthSouth® in Grand Forks, North Dakota.

THE CONTROL GROUP

The control group was instructed to continue with their daily activities and exercise regimen. They were asked to not add any additional exercise or balance training during the duration of the study.

DATA ANALYSIS

The independent variable is the group in which the subject participated, exercise or control group, and is nominal datum. The dependent variables consisted of the scores on the Berg Balance Measure, measurements of ankle AAROM and Functional Reach, and times for the TU&GT. The scores from the Berg Balance Measure were considered to be ordinal data, while the others were considered to be ratio data. The Analysis of Covariance was used to analyze the data. The statistical analysis was performed using SPSS Version 10.0 using an alpha level of $p=.05$ for all statistical tests.

REPORTING OF RESULTS

Upon completion of this study, a copy of this scholarly project was given to HealthSouth® and the University of North Dakota Department of Physical Therapy. This study was completed in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota.

CHAPTER IV

RESULTS

This balance study consisted of 22 volunteer subjects with 10 in the control group (8 female, 2 male) and 12 in the exercise group (8 female, 4 male). A summary of age for all subjects (n=22) is listed in Table 1.

Table 1. Summary of Age of Participants.

Group	Mean	SD	Minimum	Maximum
Combined	74.8	8.31	60	87
Control	75.5	7.54	61	87
Exercise	74.2	9.19	60	87

A total of 18 balance exercise sessions, lasting 30 minutes each, were offered over a six-week period. The minimum number of sessions attended was 14 (78%) and the maximum was 18 (100%), with an average of 16.4 (91.2%).

The Analysis of Covariance test was used to compare the results from the Berg Balance Measure, TU&GT, Functional Reach, and ankle dorsiflexion measurements between the two groups both before and after the six-week exercise period (see Table 2). Following six weeks of exercising, there was a significant difference between the control group and the exercise group on the Berg Balance Measure and the Functional Reach, with the exercise group demonstrating an increase in scores. No significant difference was found between the two groups on the TU&GT scores and ankle dorsiflexion measurements. An alpha level of $p=0.05$ was used to determine significance.

Table 2. Analysis of Covariance Results for Balance Measurements.

Balance Measures	Exercise Group				Control Group				Ancova	
	Pre exercise		Post exercise		Pre exercise		Post exercise			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	Sig
Berg Balance Measure	51.6	3.8	53.8	2.1	51.6	2.5	52.1	2.7	6.092*	0.023
Functional Reach	8.8	1.7	10.3	2.1	9.7	3.2	9.3	2.9	4.977*	0.038
Timed Get Up and Go	10.5	1.4	9.5	1.9	11.0	2.7	10.3	2.2	0.442	0.514
Ankle DF with knee extension	0.9	4.3	1.5	4.5	2.7	4.7	2.4	3.6	0.110	0.743
Ankle DF with knee flexion	9.4	5.7	8.3	4.5	10.5	4.5	8.2	3.6	0.491	0.492

*$p<0.05$

The Berg Balance Measure scores for the exercise group significantly increased by an average of 2.17 points, whereas the control group only increased by an average of 0.50 points, which was not statistically significant. The Functional Reach scores for the exercise group significantly increased by an average of 1.43 inches, whereas the control group only increased by 0.72 inches, which again was not statistically significant. The TU&GT scores did not decrease significantly and ankle dorsiflexion measurements did not increase significantly in either group.

CHAPTER V

DISCUSSION

The geriatric population is often at an increased risk for falls as the postural control mechanisms of this age group decline. The integration of the visual, vestibular, somatosensory, and musculoskeletal components of the postural control mechanism is essential in maintaining balance.[5,6] It is important to implement balance activities to reduce these declines, and therefore reduce the risk of falls.

The results of this study show that the six-week "Get Off Your Rocker" balance exercise class can significantly improve balance in the geriatric population. These results coincide with additional research that indicated that balance exercises improved postural control.[8-12]

The subjects in the exercise group demonstrated significantly improved scores in the Berg Balance Measure following the six-week class. Similarly, Rose and Clark[52] found that an eight-week balance training regime resulted in significantly improved Berg Balance Measure scores in a group of elderly subjects. The training protocol in the study was performed on a Pro-Balance Master®, a computerized force-platform that provides biofeedback regarding postural sway. The balance exercises performed included dynamic movements that challenged the center of gravity, including reaching for objects, catching balls, and completing tasks while standing on a foam surface. In addition,

Shumway-Cook et al[11] found that balance training programs for a group of adults over the age of 65 resulted in significantly improved scores on the Berg Balance Measure. The subjects in this study participated in an eight to twelve week session of balance exercises and mobility activities that were individually tailored according to evaluation findings by a physical therapist.

The subjects in the exercise group in the present study also demonstrated a significant improvement in scores for the Functional Reach Test. Likewise, Okumiya et al[53] established that a six-month exercise class that focused on balance significantly improved scores on the Functional Reach Test in a population over 74 years of age. The exercises these individuals performed included light aerobic exercises, which consisted of walking, balance training, coordination tasks, and activities with balls. The study by Okumiya et al[53] differed from the "Get Off Your Rocker" study in that the subjects also performed calisthenics and muscle strengthening exercises. On the contrary, McMurdo et al[54] found that a six-month seated balance exercise training program did not significantly improve scores on the Functional Reach Test in individuals over the age of 69. The activities performed in this study included movements to improve joint flexibility, training to strengthen major muscle groups, and seated exercises to improve balance. The exercises utilized may not have been of sufficient intensity as research has shown that in order to improve balance, exercises must be performed in standing. This particular training must include backwards walking, weight transference, and turning around.

A significant improvement was also noted on the TU&GT for the exercise group in this study. Rose and Clark[52], and Okumiya et al[53] conducted studies, as previously discussed, in which subjects also demonstrated improvements in the TU&GT. However, McMurdo, Millar, and Daly[54] did not find a significant improvement on the TU&GT. This finding may be due to the fact that these balance exercises were performed in a seated position as previously mentioned.

In a study performed by Brown and Holloszy[55] in 1991, subjects age 60-71 participated in a three-month exercise class to determine the effects on the subjects' balance, strength, and range of motion. The exercise regime consisted of one-legged activities, walking on heels and toes, and lifting the opposite arm and leg while on all fours. This study is similar to the "Get off your Rocker" study as subjects were found to have no significant improvements in ankle range of motion, despite the fact that they did demonstrate significant improvements in strength and balance.

LIMITATIONS

The results of this study may have been influenced by several different factors including the size, selection, and abilities of the subjects. The subjects in this study were a sample of convenience. Originally, 26 individuals volunteered for the study, but for various reasons four subjects were unable to participate. Three subjects presented with high blood pressure readings that were beyond the criteria. Another subject was eliminated secondary to the fact he did not attain the minimal score of 45 on the Berg Balance Measure. In addition, the number of subjects in the study needed to be limited to in order to ensure safety

in the "Get Off Your Rocker" balance exercise class. The instructors requested that the class size be limited to ten people so that they could supervise and assist subjects as needed.

Due to the fact that the subjects were gathered from a homogenous group of highly functioning elderly individuals, there was little room for improvement in assessment scores. The average initial score on the Berg Balance Measure was 51.58 in the exercise group, which was a high score that did not leave much room for progress. It was noted that individuals who started with comparatively lower scores on the Berg, were those who showed the most improvement.

Additional limitations of this study included class design, participant motivation, and tester experience. The "Get Off Your Rocker" balance exercise class consisted of exercises that were designed for highly functioning individuals. The class was intended to be held in a group setting with the supervision of only one instructor. The nature of the activities in the class did not allow for the use of assistive devices, therefore eliminating the participation of lower functioning individuals. Another limitation was the motivation of the participants as they were eager to please the testers. Several participants reported to the testers that they had practiced certain testing activities outside of the class in order to improve their scores. The tester experience, which was considered to be novice, was another limiting factor of this study. At the time of the study, all testers were physical therapy students with limited clinical experience.

The results of this study demonstrated a significant increase in scores on the Berg Balance Measure and the Functional Reach Test. Upon closer

examination, the raw scores showed that there was an improvement of 2.17 on the Berg and 1.43 inches on the Functional Reach Test in the exercise group. Whether or not these slight increases translate into improved safety and function are questionable. These small improvements may carry over into the performance of daily activities, but they may be rather discrete.

While the formal testing measures showed small but significant improvements in the exercise group, the subjective comments made by the participants suggested that improvements were greater than actually measured. Subjects reported that they felt more confident in their level of safety and performance when performing daily activities that challenged their balance. In addition, they expressed their enjoyment of the social interaction while participating in the group setting. Several of the participants planned to continue attending the "Get Off Your Rocker" balance exercise class after the completion of this study.

SUGGESTIONS FOR FURTHER RESEARCH

Ideas for future studies may include the use of a larger sample size, recruitment of a less homogeneous group regarding functional level of subjects, and the use of testers with more clinical experience. In order to accommodate for a wider range of balance capabilities it would be necessary to implement a class with greater supervision and safety measures. In addition, the activities would need to be modified to allow for the use of assistive devices.

Many performance-based assessments were used in this study in order to evaluate function and safety of the subjects. A short questionnaire regarding

benefits and satisfaction of the class was administered to the exercise group upon completion of the study. It is suggested that future studies utilize an objective self-report measure in order to more fully assess the participants' perceived improvements.

CONCLUSION

The results of this study demonstrated that participation in the "Get Off Your Rocker" balance exercise class resulted in significant improvements in postural control. The nature of the class includes such activities as Swiss ball exercises, single-leg stance activities, tandem walking, and coordination activities. These activities challenge the base of support and help to improve the postural control mechanisms that are necessary in maintaining balance. The subjects in the exercise group demonstrated good compliance and class attendance. They also expressed that the group interaction served as a motivator to their efforts. The findings in this study suggest that classes such as the "Get Off Your Rocker" balance exercise class prove to be a beneficial tool for physical therapists for improving balance in the elderly.

APPENDIX A

REPORT OF ACTION: EXEMPT/EXPEDITED REVIEW

University of North Dakota Institutional Review Board

Date: December 20, 2000 **Project Number:** IRB-200101-122

Name: Cindy Flom-Meland, Heather Bethard, Susie McGarry **Department/College:** Physical Therapy

Project Title: The Effects of "The Get Off Your Rocker" Exercise Class on Balance

The above referenced project was reviewed by a designated member for the University's Institutional Review Board on January 4, 2001 and the following action was taken:

☒ Project approved. **EXPEDITED REVIEW** Category No. 7
Next scheduled review is on: January 2002

☐ Project approved. **EXEMPT REVIEW** Category No. _____
This approval is valid until _____ as long as approved procedures are followed. No periodic review scheduled unless so stated in the Remarks Section.

☐ Project approved **PENDING** receipt of corrections/additions. These corrections/additions should be submitted to ORPD for review and approval. **This study may NOT be started UNTIL final IRB approval has been received**. (See Remarks Section for further information.)

☐ Project approval **deferred. This study may not be started until final IRB approval has been received**. (See Remarks Section for further information.)

☐ Project **denied.** (See Remarks Section for further information.)

REMARKS: Any changes in protocol or adverse occurrences in the course of the research project must be reported immediately to the IRB Chairperson or ORPD.

PLEASE NOTE: Requested revisions for student proposals MUST include adviser's signature.

Signature of Designated IRB Member — Date

cc: Cindy Flom-Meland, Adviser
Chair, Department of Phy. Ther.
Dean, School of Medicine
UND's Institutional Review Board

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 310 Form may be required. Contact ORPD to obtain the required documents.

(6/2000)

X EXPEDITED REVIEW REQUESTED UNDER ITEM 7 (NUMBER[S]) OF HHS REGULATIONS
___ EXEMPT REVIEW REQUESTED UNDER ITEM ____ (NUMBER[S]) OF HHS REGULATIONS

UNIVERSITY OF NORTH DAKOTA HUMAN SUBJECTS REVIEW FORM FOR NEW PROJECTS OR PROCEDURAL REVISIONS TO APPROVED PROJECTS INVOLVING HUMAN SUBJECTS .

Please include ALL information and check ALL blanks that apply.

PRINCIPAL INVESTIGATOR: Cindy Flom-Meland, Heather Bethard, Susie McGarry **TELEPHONE:** 777-2831 **DATE:** 12/19/00

ADDRESS TO WHICH NOTICE OF APPROVAL SHOULD BE SENT: Cindy Flom-Meland, Box 9037 Physical Therapy

SCHOOL/COLLEGE: Medicine **DEPARTMENT:** Physical Therapy **PROPOSED PROJECT DATES:** 01/08/01-12/15/01

(E.g., A&S, Medicine, EHD, etc.) (Month/Day/Year)

PROJECT TITLE: The Effects of "The Get Off Your Rocker" Exercise Class on Balance

FUNDING AGENCIES (IF APPLICABLE):

TYPE OF PROJECT (Check ALL that apply):

X NEW PROJECT ___ CONTINUATION ___ RENEWAL ___ DISSERTATION OR THESIS RESEARCH X STUDENT RESEARCH PROJECT

___ CHANGE IN PROCEDURE FOR A PREVIOUSLY APPROVED PROJECT

DISSERTATION/THESIS ADVISER, OR STUDENT ADVISER: Cindy Flom-Meland

PROPOSED PROJECT: ___ INVOLVES NEW DRUGS (IND) ___ INVOLVES NON-APPROVED USE OF DRUG X INVOVLES A COOPERATING INSTITUTION

IF ANY OF YOUR SUBJECTS FALL IN ANY OF THE FOLLOWING CLASSIFICATION, PLEASE INDICATE THE CLASSIFICATION(S):

☐ MINORS (<18 YEARS) ☐ PREGNANT WOMEN ☐ MENTALLY DISABLED ☐ FETUSES ☐ PERSONS WITH MENTAL RETARDATION

☐ PRISONERS ☐ ABORTUSES ☐ UND STUDENTS (>18 YEARS)

IF YOUR PROJECT INVOLVES ANY HUMAN TISSUE, BODY FLUIDS, PATHOLOGICAL SPECIMENS, DONATED ORGANS, FETAL MATERIAL, OR PLACENTAL MATERIALS, CHECK HERE ____

IF YOUR PROJECT HAS BEEN\WILL BE SUBMITTED TO ANOTHER INSTITUTIONAL REVIEW BOARD(S), PLEASE LIST NAME OF BOARD(S):

Status: ____ Submitted; Date _____ ____ Approved; Date _____ ____ Pending

1. **ABSTRACT:** (LIMIT TO 200 WORDS OR LESS AND INCLUDE JUSTIFICATION OR NECESSITY FOR USING HUMAN SUBJECTS.)

Balance training exercises have been proven to show significant improvements in balance in the elderly population, which therefore decreases their risk for falls. Poor balance is a predicting risk factor leading to an increased number of falls in the elderly. An estimated 1/3 of adults over the age of 65, who reside at home, experience one or more falls per year. In this age category, falls restrict function and are a leading cause of accidental deaths. This study will measure the influences a balance exercise class will have on improving balance in adults over the age of 65.

This study requires 20-30 subjects who are 65 years of age and over. Initially all subjects will be required to complete three standardized balance measures, and ankle dorsiflexion range of motion measurements. Subjects will be randomly assigned to the "Get Off Your Rocker" exercise group or to the control group. The exercise group will partake in the "Get Off Your Rocker" exercise class for 30 minutes 3x/wk for 6 weeks. The initial balance testing will be repeated following the 6-week class. The expected outcome of this study is to measure an improvement in balance in the exercising group compared to the control group.

PLEASE NOTE: Only information pertinent to your request to utilize human subjects in your project or activity should be included on this form. Where appropriate attach sections from your proposal (if seeking outside funding).

2. PROTOCOL: (Describe procedures to which humans will be subjected. Use additional pages if necessary. Attach any surveys, tests, questionnaires, interview questions, examples of interview questions (if qualitative research), etc., the subjects will be asked to complete.)

Recruitment: The exercise instructor will recruit subjects from the Red River Valley by advertising in the Grand Forks Herald newspaper and by speaking with residents in various elderly community apartments. For this study a total of 20-30 subjects are required.

Selection: Subjects must be 65 years of age or older, and live and ambulate independently without the use of assistive devices. In order to participate in this study subjects must have a minimum score of 45 on the Berg Balance Measure. Subjects will be excluded if found to have abnormally high or uncontrolled blood pressure, noted by a blood pressure screen. Elderly adults who currently participate in the "Get Off Your Rocker" class will also be excluded from the study.

Procedure: Initially a pilot study will be conducted using 10 people of varying age (above the age of 18 – no minors will be allowed). These subjects will be tested by the investigators, using the Berg Balance Measure, the Timed Get Up and Go, and the Functional Reach. Ankle dorsiflexion range of motion measurements will also be taken. There will be a test and retest component to look for inter and intra reliability of the investigators.

Once the pilot study is completed, all participants of the "Get off Your Rocker" study will complete the same standardized balance tests conducted during the pilot study consisting of the Berg Balance Measure, the Timed get UP and Go, and the Functional Reach. Bilateral ankle dorsiflexion range of motion measurements will also be taken. Subjects will be randomly assigned to the exercise group who will participate in the "Get Off Your Rocker" class, or the non-exercising, control group of community dwelling individuals.

The exercising group will be led by the Healthsouth Fitness Director and staff, who are all CPR certified. This group will participate in the 30 minute "Get Off Your Rocker" balance exercise class 3x/wk for 6 continuous weeks. This exercise class is a low intensity, low impact class that emphasizes single leg stance activities, Swiss ball movements, tandem walking, and various activities that challenge the base of support. These are typical exercises that would be incorporated into physical therapy treatment programs. Both the exercise group and the control group are asked to continue with their activities and to no add any exercise changes, with the exception of the balance class for the exercise group. Both groups will complete the initial testing immediately following completion of the 6-week class. Standardized statistical measures will be utilized to compare the results from initial and final evaluation scores of the exercising group and the control group. The "Get Off Your Rocker" class and the testing procedures will be conducted at Healthsouth in Grand Forks, ND. Following completion of the study the exercise group will also be asked to fill out a short questionnaire (see attached form).

Informed Consent: Subjects will be given and asked to sign an information and consent form prior to participating in the study. These individuals are able to read and understand the document presented to them (see attached form).

Compensation: Following the completion of the study, participants in both the exercise and control groups will be compensated with a free two-month membership to the Healthsouth fitness facility. The exercise class will also receive the "Get Off Your Rocker" exercise class free of charge.

Risk: The "Get Off Your Rocker" exercise class is a form of physical activity that the investigators believe has a minimal risk of injury to the participants. However, there is always some risk of injury with any form of physical activity. If injury does occur, the individual will be encouraged to seek medical attention. All medical expenses will be the responsibility of the individual and his/her third party payer. Subjects will also be excluded if found to have uncontrolled blood pressure or a blood pressure abnormality, noted by a blood pressure screen. All exercise instructors are certified in CPR.

3. BENEFITS: (Describe the benefits to the individual or society.)
The purpose of this study is to determine the effects that the "Get Off Your Rocker" exercise class has on balance in adults 65 years of age and older. Research has shown that exercising on a regular basis has been a key component to improving balance. Subjects are expected to have variable balance scores which is a realistic sample of the population. We expect that all individuals who participate in the exercise class will have an increase in balance scores. The goal of our study is to demonstrate that participation in a balance exercise program will enhance the balance of those individuals.

Additional benefits of this study include social interaction amongst peers, an increased confidence level when performing activities of daily living, an increased awareness of the importance of exercise, and the promotion of general health and well being.

Following the completion of the study, participants in both the exercise and control groups will be compensated with a free two-month membership to the Healthsouth fitness facility. The exercise class will also receive the "Get Off Your Rocker" exercise class free of charge.

4. RISKS: (Describe the risks to the subject and precautions that will be taken to minimize them. The concept of risk goes beyond physical risk and includes risks to the subject's dignity and self-respect, as well as psychological, emotional or behavioral risk. If data are collected which could prove harmful or embarrassing to the subject if associated with him or her, then describe the methods to be used to protect the confidentiality of data obtained, debriefing procedures, storage of data, how long date will be stored (must be a minimum of three years), final disposition of data, etc.)

The "Get Off Your Rocker" exercise class is a form of physical activity that the investigators believe has a minimal risk of injury to the participants. However, there is always some risk of injury with any form of physical activity. If injury does occur, the individual will be encouraged to seek medical attention. All medical expenses will be the responsibility of the individual and his/her third party payer. Subjects will also be excluded if found to have uncontrolled blood pressure or a blood pressure abnormality, noted by a blood pressure screen. All exercise instructors are certified in CPR.

The information obtained throughout this study will be kept confidential. The subjects' names and personal information will not be revealed at any time throughout the study. A hard copy of the statistics of this study will be secured, in a locked office, in the physical therapy department at the University of North Dakota. Unless these records are required for future studies, they will be destroyed three years after the study has ended.

5. **CONSENT FORM:** Attach a copy of the **CONSENT FORM** to be signed by the subject (if applicable) and/or any statement to be read to the subject should be attached to this form. If no **CONSENT FORM** is to be used, document the procedures to be used to assure that infringement upon the subject's rights will not occur.

   Describe where signed consent forms will be kept and for how long (must be a minimum of 3 years), including plans for final disposition or destruction.

The information obtained throughout this study will be kept confidential. The subjects' names and personal information will not be revealed at any time throughout the study.

Subjects will be given and asked to sign an information and consent form prior to participating in the study. These individuals are able to read and understand the document presented to them. A copy of the information and consent form used will be attached to this form.

Following the completion of the study, participants in both the exercise and control groups will be compensated with a free two-month membership to the Healthsouth fitness facility. The exercise class will also receive the "Get Off Your Rocker" exercise class free of charge.

6. For **FULL IRB REVIEW** forward a signed original and fifteen (15) copies of this completed form, including fifteen (15) copies of the proposed consent form, questionnaires, examples of interview questions, etc. and any supporting documentation to the address below. An original and 19 copies are required for clinical medical projects. In cases where the proposed work is part of a proposal to a potential funding source, one copy of the completed proposal to the funding agency (agreement/contract if there is no proposal) must be attached to the completed Human Subjects Review Form if the proposal is non-clinical; 7 copies if the proposal is clinical medical. If the proposed work is being conducted for a pharmaceutical company, 7 copies of the company's protocol must be provided.

   Office of Research & Program Development
   University of North Dakota
   Grand Forks, North Dakota 58202-7134

   On campus, mail to: Office of Research & Program Development, Box 7134, or drop it off at Room 105 Twamley Hall.

   For **EXEMPT** or **EXPEDITED REVIEW** forward a signed original, including a copy of the consent form, questionnaires, examples of interview questions, etc. and any supporting documentation to one of the addresses above. In cases where the proposed work is part of a proposal to a potential funding source, one copy of the completed proposal to the funding agency (agreement/contract if there is no proposal) must be attached to the completed Human Subjects Review Form.

The policies and procedures on Use of Human Subjects of the University of North Dakota apply to all activities involving use of Human Subjects performed by personnel conducting such activities under the auspices of the University. No activities are to be initiated without prior review and approval as prescribed by the University's policies and procedures governing the use of human subjects.

SIGNATURES:

Cindy Flom-Meland	12-19-00
Principal Investigator	Date
Cindy Flom-Meland	12-19-00
Project Director or Student Adviser	Date
Training or Center Grant Director	Date

HEALTHSOUTH®

December 2000

Healthsouth Sports Medicine will be assisting UND physical therapy regarding a balance study beginning in January 2001. The balance study will provide Healthsouth with valuable information about the benefits of our existing Get Off Your Rocker program. We are excited to review raw data from the study that will be presented at the IDEA convention in April in Chicago.

We look forward to supporting this study and providing our community with an opportunity to improve their health and balance.

Sincerely,

Jill Bisson

Jill Bisson, Fitness Director
Healthsouth

SCHOOL OF MEDICINE & HEALTH SCIENCES
DEPARTMENT OF PHYSICAL THERAPY
501 NORTH COLUMBIA ROAD
P.O. BOX 9037
GRAND FORKS, NORTH DAKOTA 58202-9037
(701) 777-2831
FAX (701) 777-4199

DATE: January 10, 2001

TO: Bette Ide, IRB Member

FROM: Cindy Flom-Meland, Instructor CFM
Physical Therapy

RE: Request for protocol change and
the addition of two more investigators

Dear Professor Ide:

My memo today contains two requests regarding project number IRB-200101-122. The first of which is to add two additional students to our list of investigators. Following the initial submission of our human subjects form our department received approval from the Graduate School to move towards collaborative research and have our students work in groups of four on their scholarly project. The names of the two individuals we would like to add to our project are Sarah McGuire and Trish Magee.

The second request is in regards to our protocol. We would like to slightly modify the inclusion criteria of our subjects to reflect an age of over 60 versus 65 and over. Even though the literature discusses the age of 65, we feel it would be beneficial to allow some younger subjects to observe if there are any noticeable changes in balance even within the ages of 60-65.

I thank you in advance for your attention to these two requests. If you have any questions for me, please do not hesitate to contact me at 777-4130. Thank you.

REPORT OF ACTION: PROTOCOL CHANGE

University of North Dakota Institutional Review Board

Date: January 10, 2001 **Project Number:** IRB-200101-122

Name: Cindy Flom-Meland, Heather Bethard, Susie McGarry, Sarah McGuire, Trish Magee **Department/College:** Physical Therapy

Project Title: The Effects of "The Get Off Your Rocker" Exercise Class on Balance

The above referenced project was reviewed by a designated member for the University's Institutional Review Board on 1-11-01 and the following action was taken:

☑ Protocol Change approved. **EXPEDITED REVIEW** Category No. 7
Next scheduled review is on: January 2002

☐ Protocol Change approved. **EXEMPT REVIEW** Category No. _____
This approval is valid until _____ as long as approved procedures are followed. No periodic review scheduled unless so stated in the Remarks Section.

☐ Protocol Change approved **PENDING** receipt of corrections/additions. These corrections/additions should be submitted to ORPD for review and approval. **This study may NOT be started UNTIL final IRB approval has been received**. (See Remarks Section for further information.)

☐ Protocol Change approval **deferred. This study may not be started until final IRB approval has been received**. (See Remarks Section for further information.)

☐ Protocol Change **denied.** (See Remarks Section for further information.)

REMARKS: Any changes in protocol or adverse occurrences in the course of the research project must be reported immediately to the IRB Chairperson or ORPD.

PLEASE NOTE: **Requested revisions for student proposals MUST include adviser's signature**.

[signature] 1-11-01

Signature of Designated IRB Member UND's Institutional Review Board — Date

cc: Cindy Flom-Meland, Adviser
Chair, Department of Physical Therapy
Dean, School of Medicine

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 310 Form may be required. Contact ORPD to obtain the required documents.

(Revised 6/2000)

STUDENT RESEARCHERS: As of June 4, 1997 (based on the recommendation of UND Legal Counsel) the University of North Dakota IRB is unable to approve your project unless the following "Student Consent to Release of Educational Record" is signed and included with your "Human Subjects Review Form."

STUDENT CONSENT TO RELEASE OF EDUCATIONAL RECORD[1]

Pursuant to the Family Educational Rights and Privacy Act of 1974, I hereby consent to the Institutional Review Board's access to those portions of my educational record which involve research that I wish to conduct under the Board's auspices. I understand that the Board may need to review my study data based on a question from a participant or under a random audit. The study to which this release pertains is _____

_____

_____

I understand that such information concerning my educational record will not be released except on the condition that the Institutional Review Board will not permit any other party to have access to such information without my written consent. I also understand that this policy will be explained to those persons requesting any educational information and that this release will be kept with the study documentation.

11/20/00
Date

Signature of Student Researchers

[1]Consent required by 20 U.S.C. 1232g.

STUDENT RESEARCHERS: As of June 4, 1997 (based on the recommendation of UND Legal Counsel) the University of North Dakota IRB is unable to approve your project unless the following "Student Consent to Release of Educational Record" is signed and included with your "Human Subjects Review Form."

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I understand that such information concerning my educational record will not be released except on the condition that the Institutional Review Board will not permit any other party to have access to such information without my written consent. I also understand that this policy will be explained to those persons requesting any educational information and that this release will be kept with the study documentation.

1/11/01
Date

Sarah McInnis
Signature of Student Researcher

[1]Consent required by 20 U.S.C. 1232g.

STUDENT RESEARCHERS: As of June 4, 1997 (based on the recommendation of UND Legal Counsel) the University of North Dakota IRB is unable to approve your project unless the following "Student Consent to Release of Educational Record" is signed and included with your "Human Subjects Review Form."

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1-11-01
Date

Signature of Student Researcher

[1]Consent required by 20 U.S.C. 1232g.

APPENDIX B

INFORMATION AND CONSENT FORM

Title: The Effects of the "Get Off Your Rocker" Exercise Class on Balance.

Healthsouth invites you to participate in a six-week balance study conducted by Susie McGarry, Heather Bethard, Trish Magee, and Sarah McGuire, who are students at the University of North Dakota in the masters of physical therapy program. This study is designed to show that balance will be improved with participation in the "Get Off Your Rocker" class. Balance will be measured by a series of tests including The Berg Balance Measure, The Timed Get Up and Go Test, The Functional Reach Test, and ankle dorsiflexion range of motion measurements. These tests are all objective measures to evaluate balance.

All volunteers will be required to perform preliminary screening consisting of The Berg Balance Measure, in which a minimal score of 45/56 is necessary to participate in the study. Participants must be 65 years of age or older and live and ambulate independently without an assistive device. Subjects must not have uncontrolled blood pressure or a blood pressure abnormality.

Eligible volunteers will be required to partake in an initial testing session which will consists of the previously mentioned balance measure tests. Blood pressure will also be taken as a precautionary measure. The testing will take place at Healthsouth in Grand Forks and will take approximately 45 minutes. **You will randomly be assigned to an exercise group who participates in the "Get Off Your Rocker" exercise class or a control group who does not.** The exercise group participants are required to attend the ½ hour class 3x/wk for 6 weeks led by the Healthsouth fitness director and staff. Attendance will be taken and absences are strongly discouraged. **The individuals in the control group will not attend any of the exercise classes.** Both the exercise group and the control group are asked to continue with their daily activities and to not add any exercise changes, with the exception of the addition of the balance class for the exercise group. Immediately following the six-week period, both groups will be required to return to Healthsouth to repeat the initial balance assessments.

The information obtained throughout this study will be kept confidential. The results of this study will be submitted for publishment and presented at the April 2001 IDEA conference, but names and personal information will not be revealed. A hard copy of the statistics of this study will be secured in the physical therapy department at the University of North Dakota. Unless these records are required for future studies, they will be destroyed three years after the study has ended. Please feel free to call the investigators Susie McGarry at (701) 594-5054, Heather Bethard at (701) 795-9875, Trish Magee at (701) 772-3678, Sarah McGuire at (701) 777-9880, Cindy Flom-Meland at (701) 777-4130, or the Fitness Director, Jill Bisson at (701) 746-8374 with any questions or concerns.

This form of exercise is considered a low risk activity, but as with any type of physical exercise there is some risk of injury. If physical injury does occur during, or as a result of

the "Get Off Your Rocker" exercise class, medical assistance will be available to you. You and/or your insurance company will cover the cost of the medical expenses, coverage will not be provided through the class.

We realize that your time is valuable, and the time commitment of participating in this study is substantial, but we believe that your result will make it well worth your time. Not only do we expect to find an improvement in your balance scores, but we also expect that you will notice an improvement in your balance with activities of daily living as well. Studies have shown that improved balance reduces the risk for future accidents due to falls. In addition, all participants will receive a free two-month membership to the Healthsouth exercise facility following completion of the study. The exercise group will receive the "Get Off Your Rocker" free of charge.

I HAVE READ AND UNDERSTAND THE ABOVE INFORMATION AND AGREE TO THE COMMITMENT OF PARTICIPATIN IN THIS RESEARCH STUDY. I REALIZE THAT IF I HAVE ANY QUESTIONS OR CONCERNS DURING ANY TIME DURING THIS STUDY I AM ENCOURAGED TO CONTACT THE RESEARCHERS OR THE FITNESS DIRECTOR. A COPY OF THIS CONSENT FORM WAS GIVEN TO ME.

_____

Participant's Signature Date

_____

Investigator's Signature Date

APPENDIX C

MEDICAL HISTORY QUESTIONNAIRE

Name: _____ Age: _____

Are you currently taking any prescription or non-prescription medications? YES NO

Anti-inflammatories ____ Muscle Relaxers ____ Pain Medication ____

List Medications: _____

Do you now have or have you ever had any of the following:

	YES	NO		YES	NO
Asthma, Bronchitis, or emphysema	___	___	Severe Frequent Headaches	___	___
Shortness of Breath/Chest Pain	___	___	Vision or Hearing Difficulties	___	___
Coronary Heart Disease or Angina	___	___	Numbness or Tingling	___	___
Do you have a pacemaker?	___	___	Dizziness or Fainting	___	___
High Blood Pressure	___	___	Bowel or Bladder Problems	___	___
Heart attack or surgery	___	___	Weakness	___	___
Stroke TIA	___	___	Weight loss/Energy loss	___	___
Congestive Heart Disease	___	___	Hernia	___	___
Blood Clot/Emboli	___	___	Vericose Veins	___	___
Epilepsy/Seizures	___	___	Allergies	___	___
Thyroid Disease or Goiter	___	___	Any Pins or Metal Implants	___	___
Anemia	___	___	Joint replacement surgery	___	___
Infectious Diseases	___	___	Neck Injury/Surgery	___	___
Diabetes	___	___	Shoulder injury/surgery	___	___
Cancer or Chemotherapy/Radiation	___	___	Elbow/hand/injury/surgery	___	___
Arthritis	___	___	Back injury/surgery	___	___
Osteoporosis	___	___	Knee injury/surgery	___	___
Gout	___	___	Leg/Ankle/Foot injury/surgery	___	___
Sleeping problems/difficulties	___	___	Are you pregnant?	___	___
Emotional/psychological problems	___	___	Do you use tobacco?	___	___

List any other information that would assist us in your care: _____

Do you have a history of falls? How often have you fallen in the past 6 months?

What types of physical exercise activities are you currently involved in? How many times per week?

Patient Signature: _____ Date: _____

APPENDIX D

GET OFF YOUR ROCKER QUESTIONAIRE

1) Do you feel the exercise class has been beneficial in improving your confidence level with balance activities?

2) What aspects of the class did you enjoy the most?

3) Do you have any recommendations for improving the class or do you feel any changes need to be made?

4) Is 3x/wk for 30 minutes a reasonable schedule to follow?

APPENDIX E

BALANCE SCALE

Name_____ Date_____

Location_____ Rater_____

ITEM	DESCRIPTION	SCORE (0-4)
1.	Sitting to standing	_____
2.	Standing unsupported	_____
3.	Sitting unsupported	_____
4.	Standing to sitting	_____
5.	Transfers	_____
6.	Standing with eyes closed	_____
7.	Standing with feet together	_____
8.	Reaching forward with outstretched arm	_____
9.	Retrieving object from floor	_____
10.	Turning to look behind	_____
11.	Turning to 360 degrees	_____
12.	Placing alternate foot on stool	_____
13.	Standing with one foot in front	_____
14.	Standing on one foot	_____
	TOTAL	_____

GENERAL INSTRUCTIONS

Please demonstrate each task and/or give instruction as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for specific time. Progressively more points are deducted if the time or distance requirements are not met, if the subject's performance warrants supervision, or if the subject touches an external support or receives assistance from the examiner. Subjects should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing are a stopwatch or watch with a second hand, and a ruler or other indicator of 2,5 and 10 inches. Chairs used during testing should be of reasonable height. Either a step or a stool (of average step height) may be used for item #12.

II – E – 8

1. SITTING TO STANDING

INSTRUCTIONS: Please stand up. Try not to use your hands for support.

( )4 able to stand without using hands and stabilize independently
( )3 able to stand independently using hands
( )2 able to stand using hands after several tries
( )1 needs minimal aid to stand or to stabilize
( )0 needs moderate or maximal assist to stand

2. STANDING UNSUPPORTED

INSTRUCTIONS: Please stand for two minutes without holding.

( )4 able to stand safely 2 minutes
( )3 able to stand 2 minutes with supervision
( )2 able to stand 30 seconds unsupported
( )1 needs several tries to stand 30 seconds unsupported
( )0 unable to stand 30 seconds unassisted

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

3. SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL

INSTRUCTIONS: Please sit with arms folded for 2 minutes.

( )4 able to sit safely and securely 2 minutes
( )3 able to sit 2 minutes under supervision
( )2 able to sit 30 seconds
( )1 able to sit 10 seconds
( )0 unable to sit without support 10 seconds

4. STANDING TO SITTING

INSTRUCTIONS: Please sit down.

( )4 sits safely with minimal use of hands
( )3 controls descent by using hands
( )2 uses back of legs against chair to control descent
( )1 sits independently but has uncontrolled descent
( )0 needs assistance to sit

5. TRANSFERS

INSTRUCTIONS: Arrange chairs(s) for a pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

( )4 able to transfer safely with minor use of hands
( )3 able to transfer safely definite need of hands
( )2 able to transfer with verbal cuing and/or supervision
( )1 needs one person to assist
( )0 needs two people to assist or supervise to be safe

6. STANDING UNSUPPORTED WITH EYES CLOSED

INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.

( )4 able to stand 10 seconds safely
( )3 able to stand 10 seconds with supervision
( )2 able to stand 3 seconds
( )1 unable to keep eyes closed 3 seconds but stays safely
( )0 needs help to keep from falling

7. STANDING UNSUPPORTED WITH FEET TOGETHER

INSTRUCTIONS: Place your feet together and stand without holding.

( )4 able to place feet together independently and stand 1 minute safely
( )3 able to place feet together independently and stand for 1 minute with supervision
( )2 able to place feet together independently but unable to hold for 30 seconds
( )1 needs help to attain position but able to stand 15 seconds feet together
( )0 needs help to attain position and unable to hold for 15 seconds

8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING

INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the finger reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

( )4 can reach forward confidently 25 cm (10 inches)
( )3 can reach forward 12 cm safely (5 inches)
( )2 can reach forward 5 cm safely (2 inches)
( )1 reaches forward but needs supervision
( )0 loses balance while trying/requires external support

9. PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION

INSTRUCTIONS: Pick up the shoe/slipper which is placed in front of your feet.

( )4 able to pick up slipper safely and easily
( )3 able to pick up slipper but needs supervision
( )2 unable to pick up but reaches 2-5 cm (1-2 inches) from slipper and keeps balance independently
( )1 unable to pick up and needs supervision while trying
( )0 unable to try/needs assist to keep from losing balance or falling

10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING

INSTRUCTIONS: Turn to look directly behind you over toward left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.

( )4 looks behind from both sides and weight shifts well
( )3 looks behind one side only other side shows less weight shift
( )2 turns sideways only but maintains balance
( )1 needs supervision when turning
( )0 needs assist to keep from losing balance or falling

11. TURN 360 DEGREES

INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

( )4 able to turn 360 degrees safely in 4 seconds or less
( )3 able to turn 360 degrees safely one side only 4 seconds or less
( )2 able to turn 360 degrees safely but slowly
( )1 needs close supervision or verbal cuing
( )0 needs assistance while turning

12. PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED

INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

( )4 able to stand independently and safely and complete 8 steps in 20 seconds
( )3 able to stand independently and complete 8 steps > 20 seconds
( )2 able to complete 4 steps without aid with supervision
( )1 able to complete > 2 steps needs minimal assist
( )0 needs assistance to keep from falling/unable to try

13. STANDING UNSUPPORTED ONE FOOT IN FRONT

INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width

( )4 able to place foot tandem independently and hold 30 seconds
( )3 able to place foot ahead of other independently and hold 30 seconds
( )2 able to take small step independently and hold 30 seconds
( )1 needs help to step but can hold 15 seconds
( )0 loses balance while stepping or standing

14. STANDING ON ONE LEG

INSTRUCTIONS: Stand on one leg as long as you can without holding.

( )4 able to lift leg independently and hold > 10 seconds
( )3 able to lift leg independently and hold 5-10 seconds
( )2 able to lift leg independently and hold = or > 3 seconds
( )1 tries to lift leg unable to hold 3 seconds but r remains standing independently
( )0 unable to try or needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)

APPENDIX F

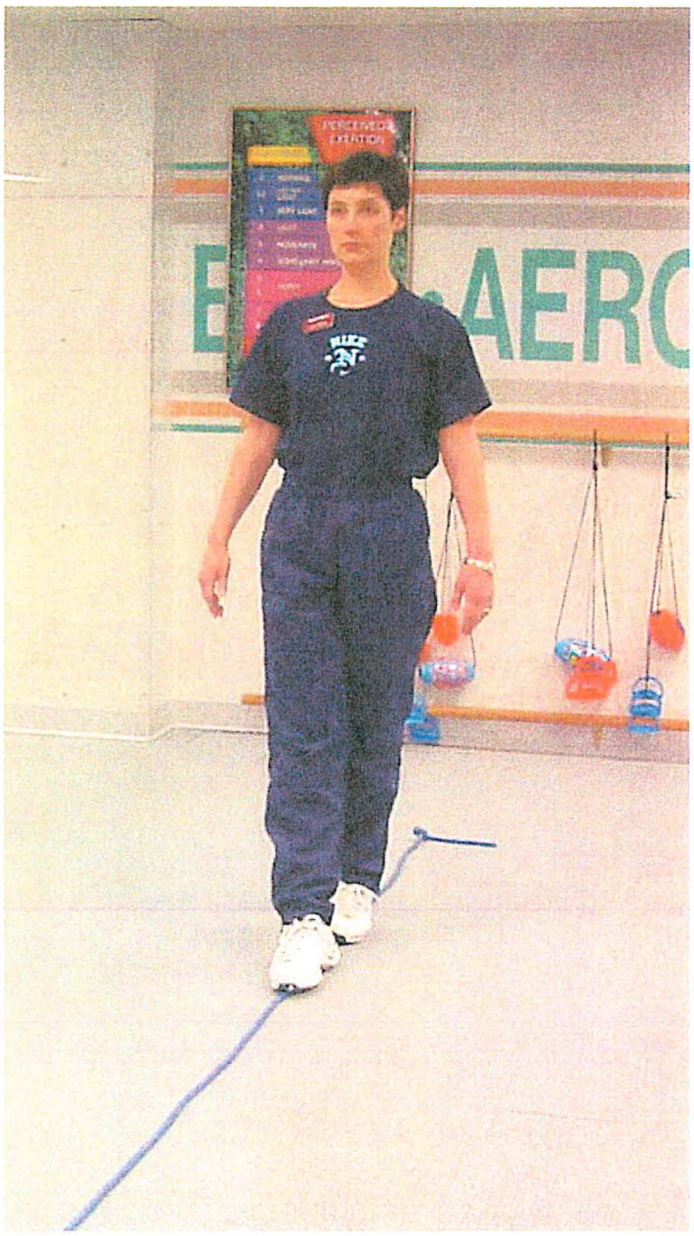

Figure 1. In the "tight rope" activity, participants advance along the rope in tandem, with scissor steps and high hip flexion.

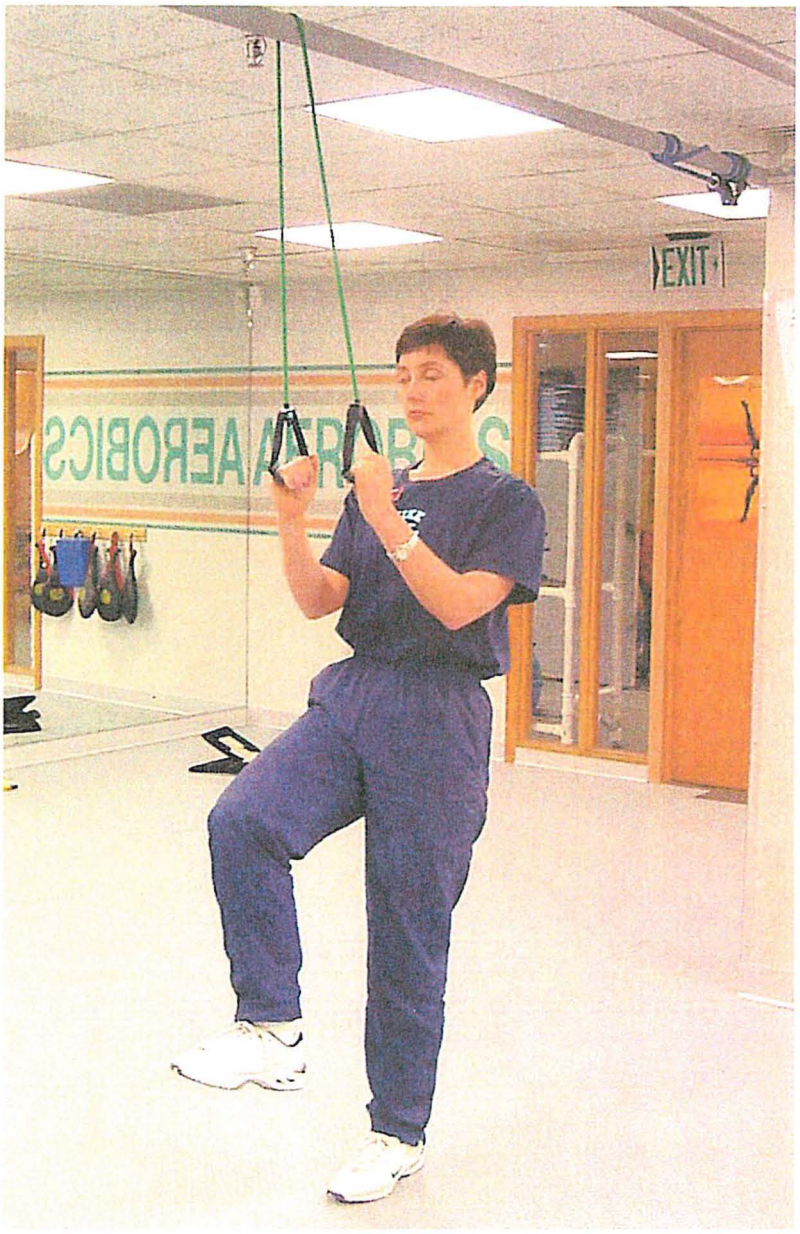

Figure 2. During the "hang time" activity subjects perform alternating knee lifts and hamstring curls while maintaining unilateral stance on the opposite foot. Rubber tubing is held for support.

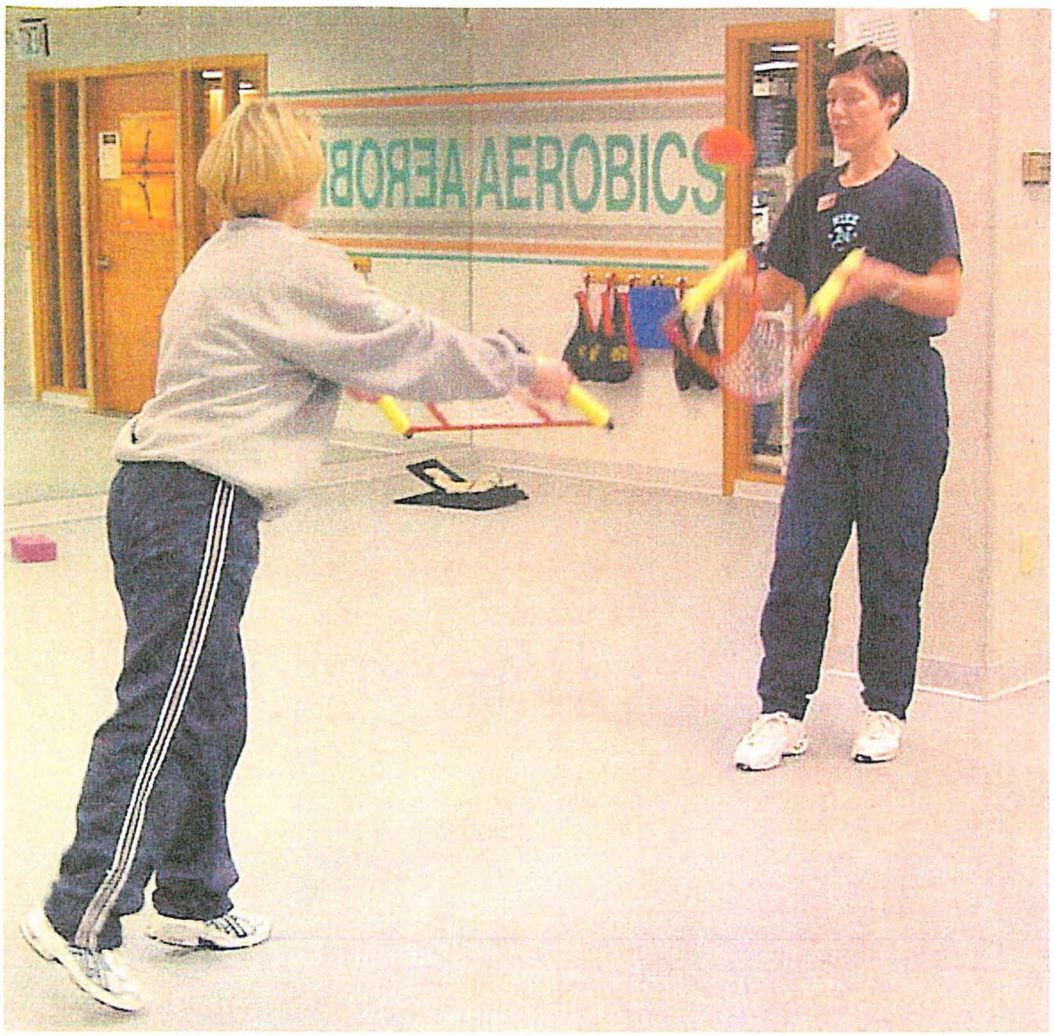

Figure 3. The object of the "net toss" is for participants to catch and return a ball between partners by closing and opening the net.

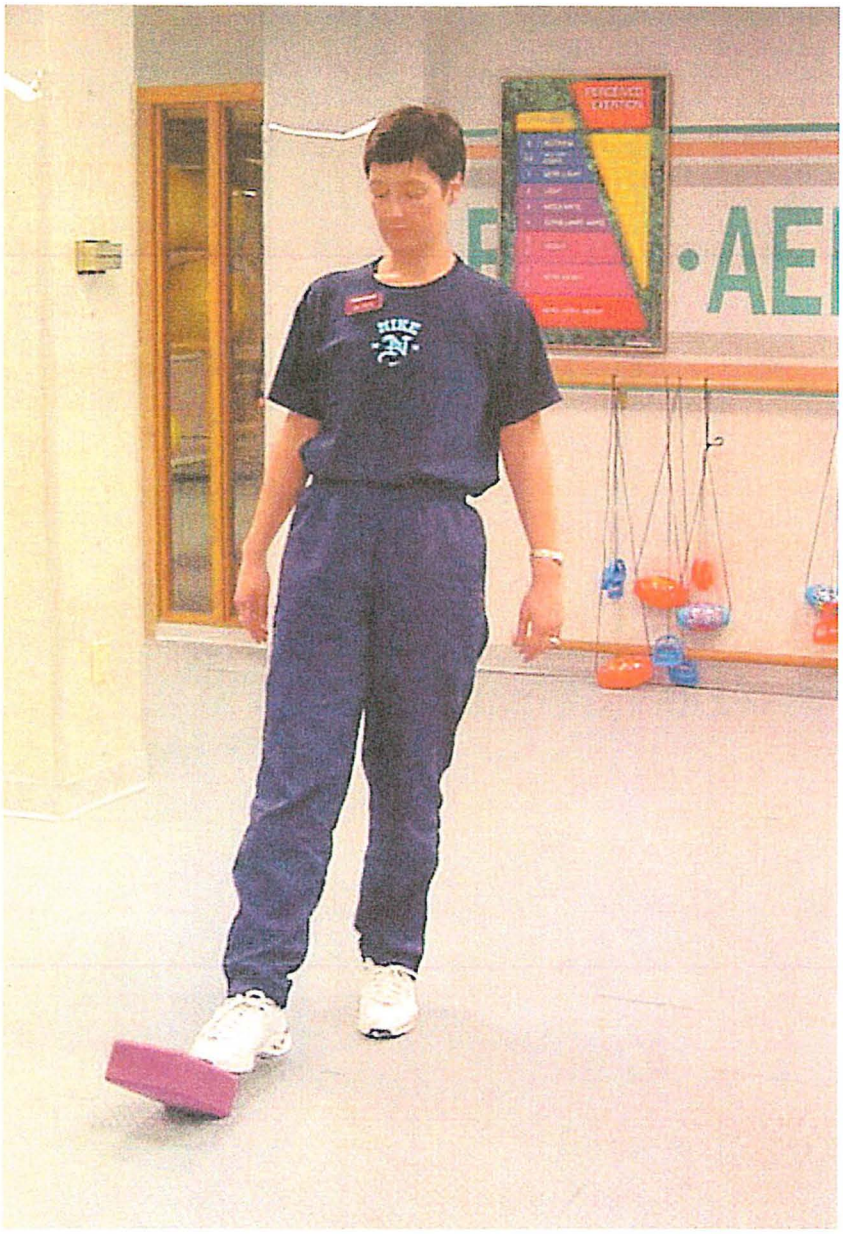

Figure 4. Using small blocks, participants use one foot to tip the block end over end in three directions while maintaining a unilateral stance on the opposite foot.

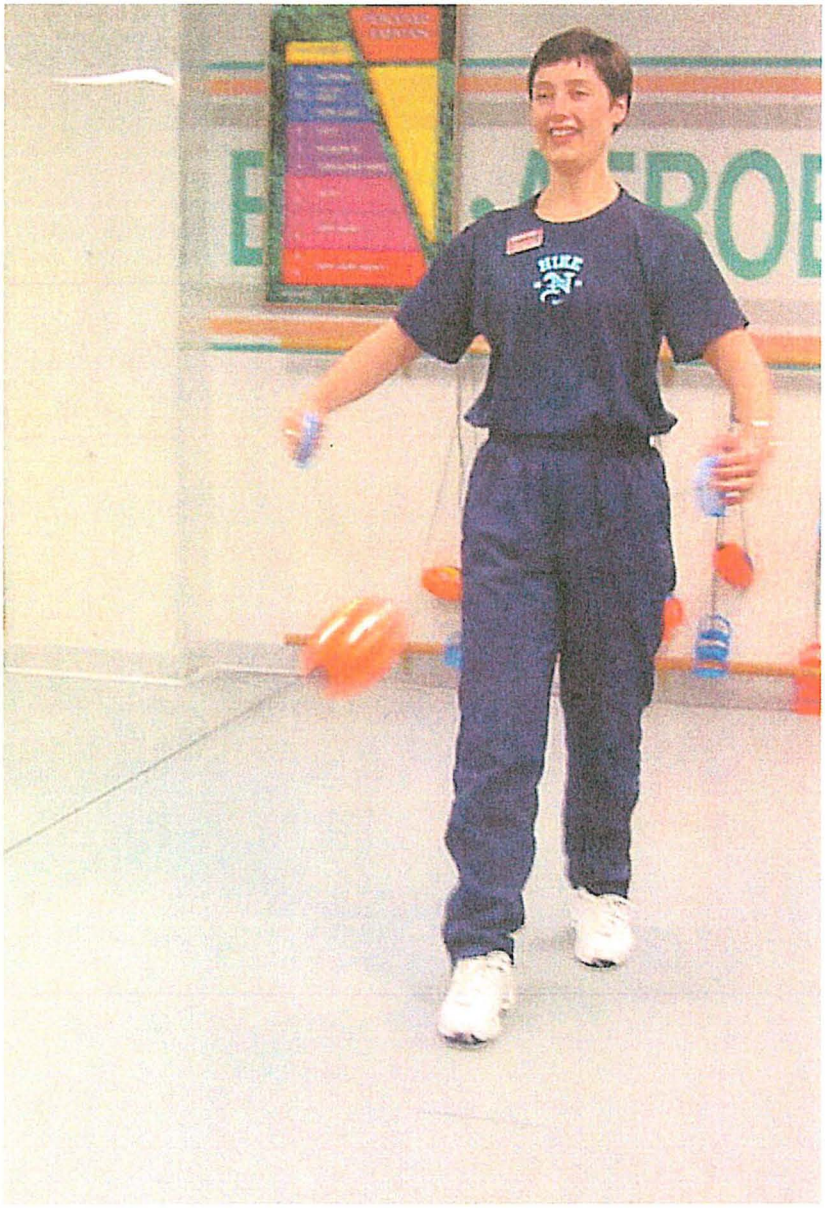

Figure 5. In the "zoom ball" exercise partners project the ball back and forth between each other by horizontally abducting and horizontally adducting their arms to spread the cords.

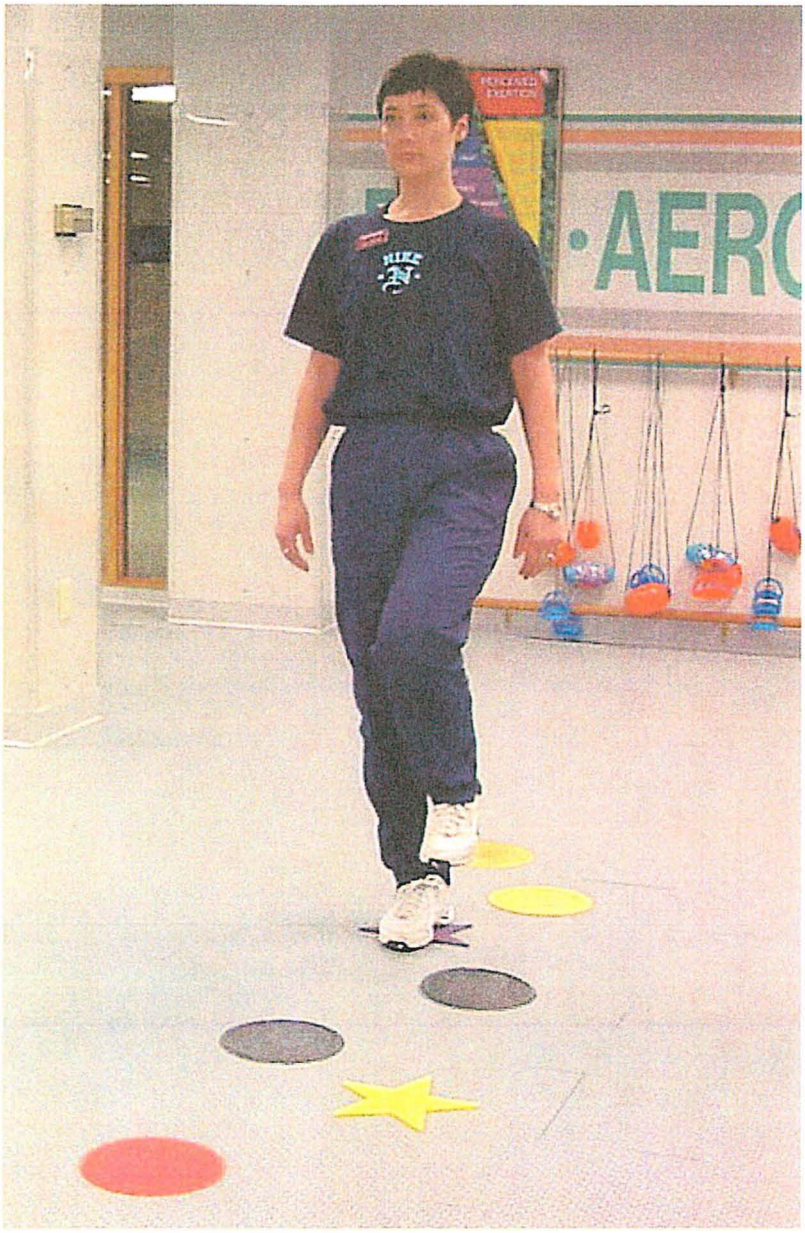

Figure 6. In the "star balance walk," subjects advance along the pathway placing one foot on each shape. They maintain a unilateral stance for three seconds on each star.

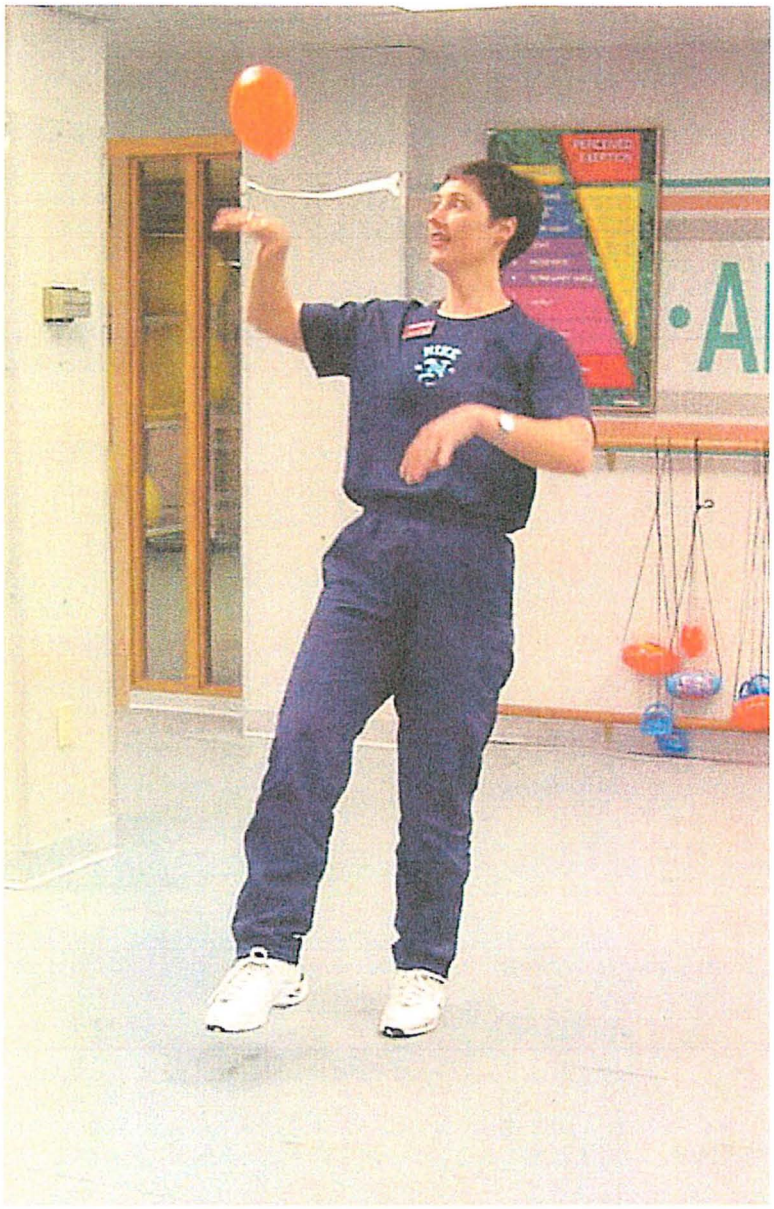

Figure 7. The "balloon walk" consists of ambulating four lengths of the exercise room while batting the balloon in the air.

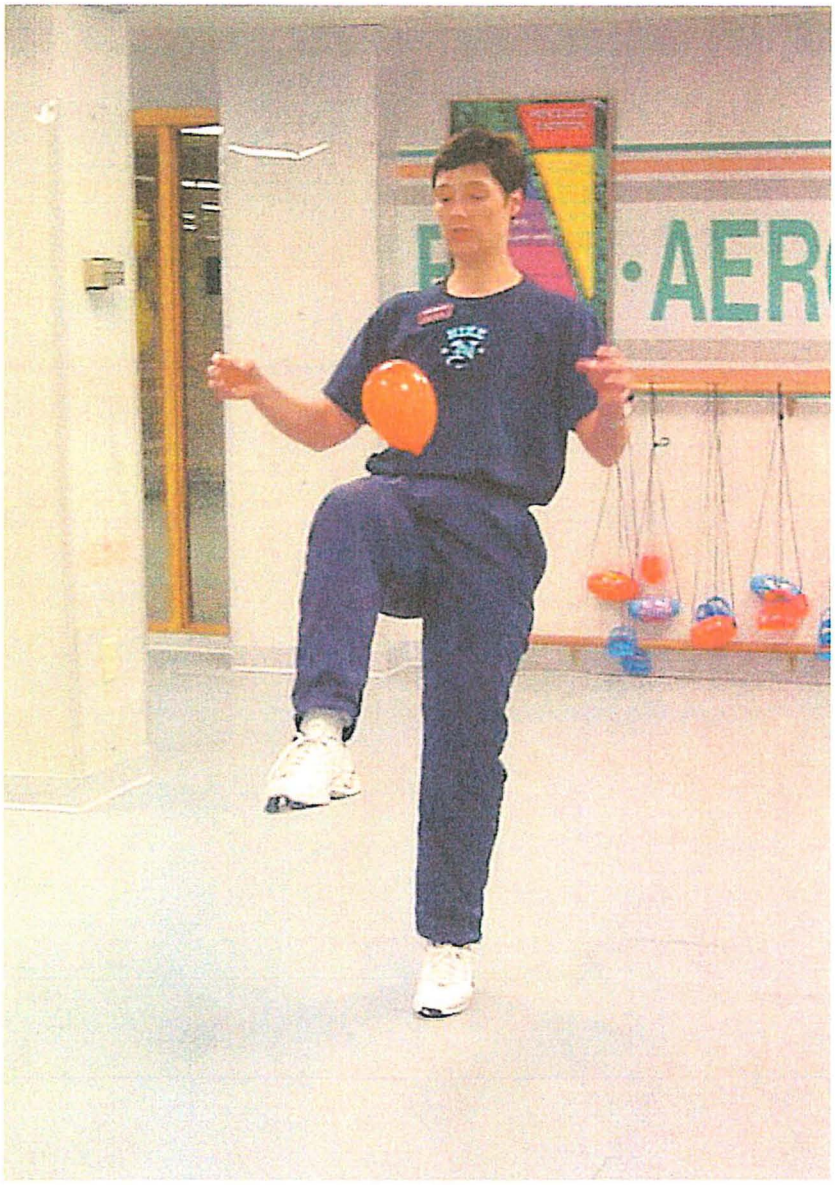

Figure 8. Participants juggle the balloon in the air by contacting the balloon with alternating knee lifts in the "balloon knee lifts."

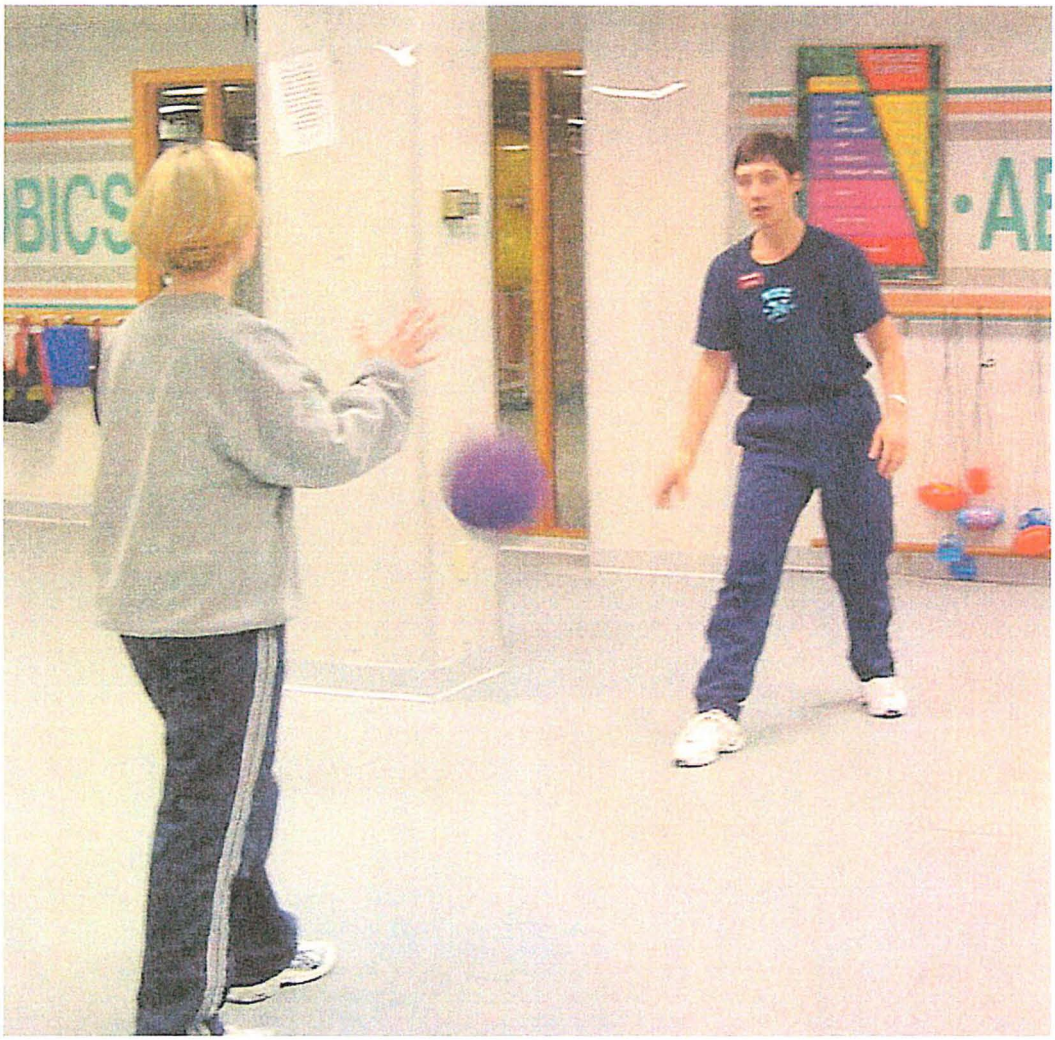

Figure 9. In the "partner ball tosses" subjects perform overhand tosses, underhand tosses, and single bounce tosses between partners.

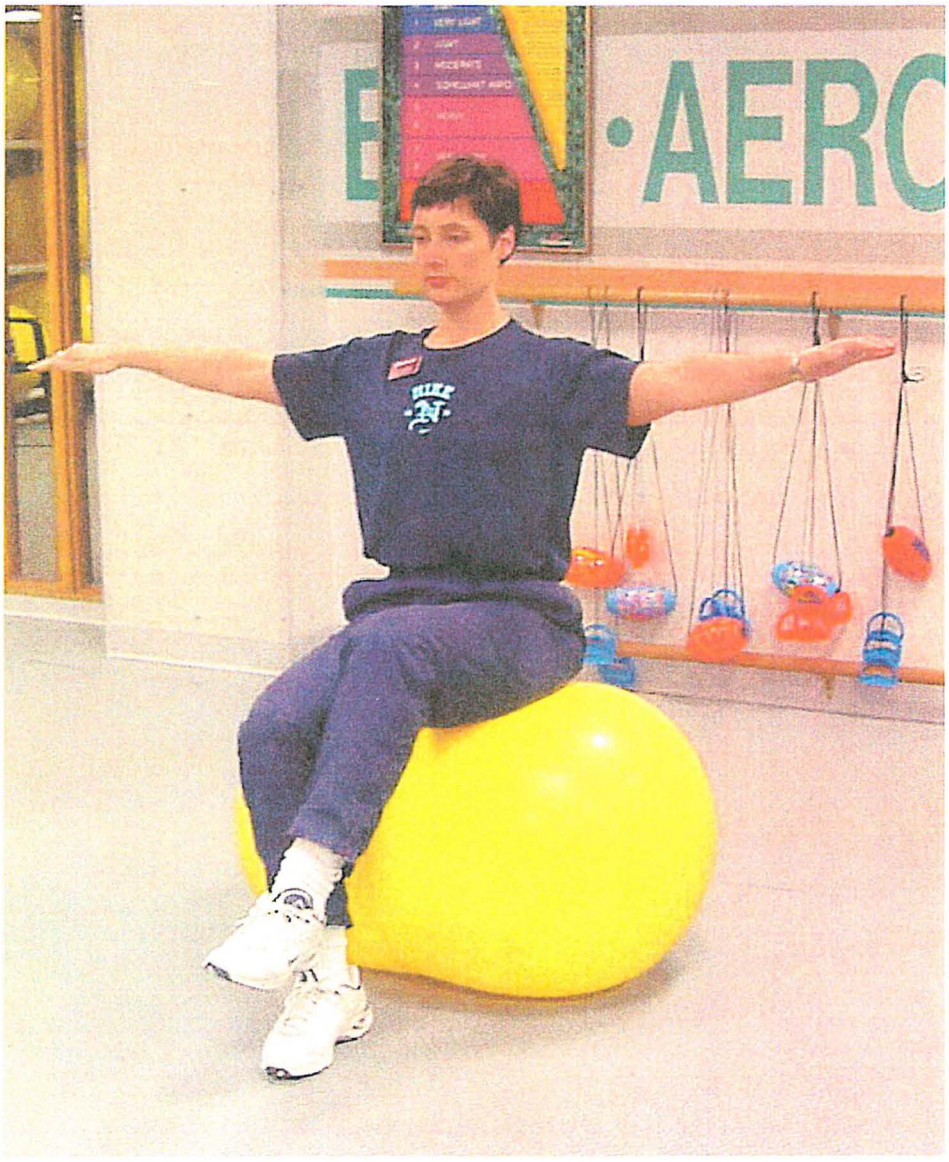

Figure 10. In this activity, subjects maintain balance on the Swiss ball while sitting with arms extended and one foot in a suspended marching position. Participants alternate between right and left feet after a five to ten second hold.

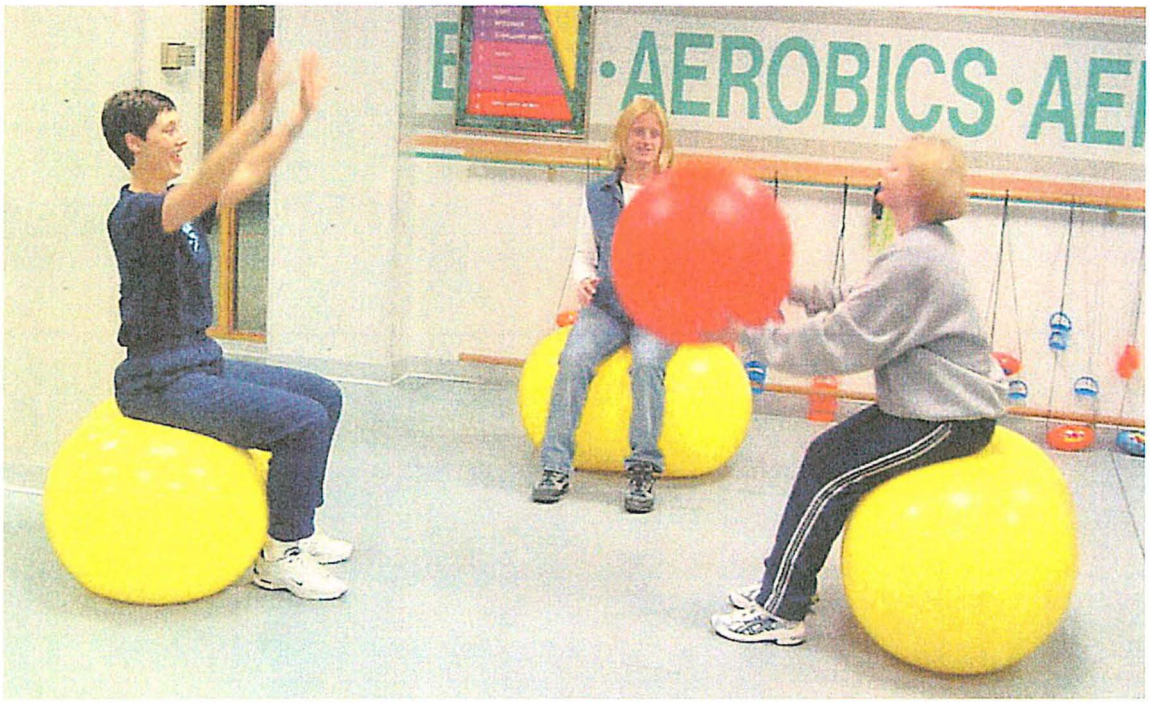

Figure 11. During the "group ball toss" participants are arranged in a circle formation while seated on Swiss balls. A smaller Swiss ball is tossed randomly around the circle while maintaining sitting balance.

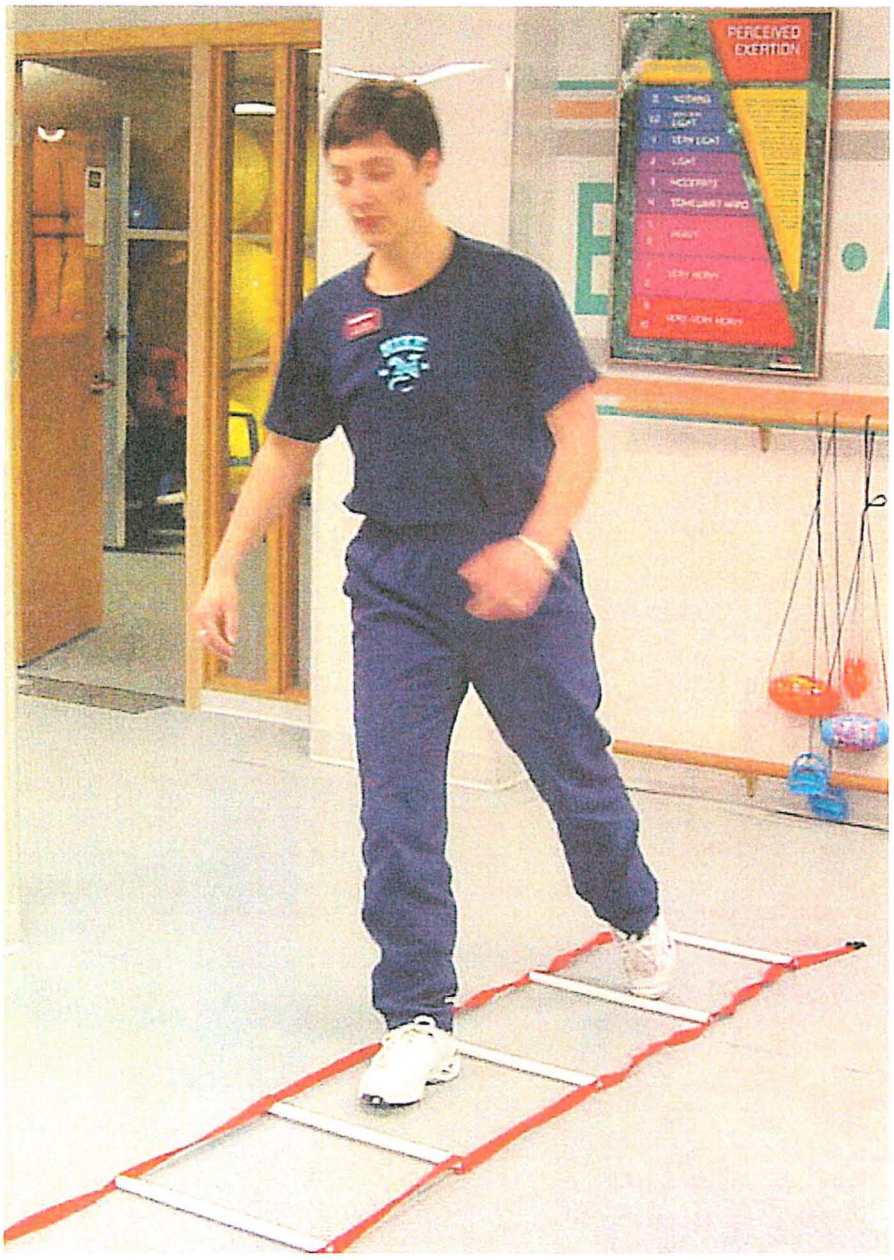

Figure 12. In this activity, participants ambulate through the floor ladder while placing their foot in every other rung.

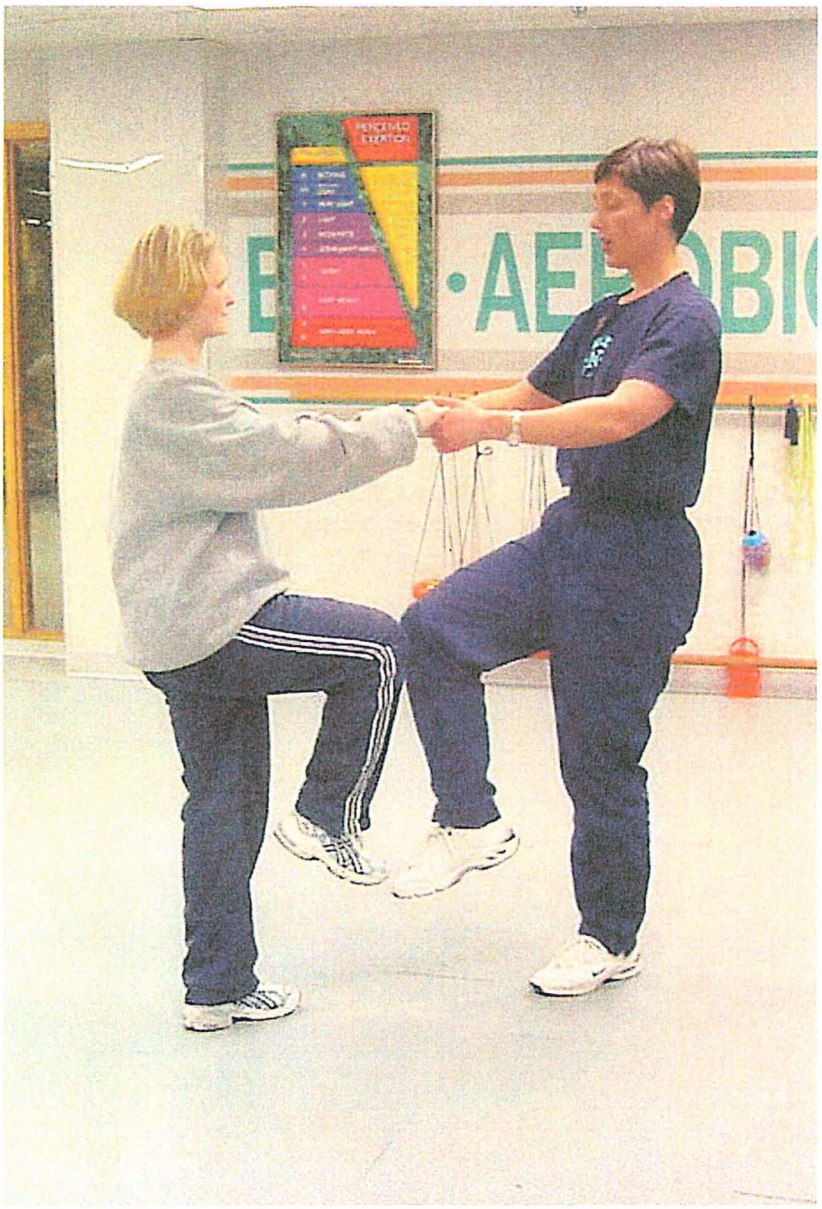

Figure 13. During this "partner balance" activity, participants stand facing each other with hands held for support while maintaining single-leg stance. Partners alternate between balancing on right and left feet.

Figure 14. This "partner balance" activity entails maintaining balance on one leg while one partner leans forward with hip extended and the other leans backward with hip flexed. The partners hold hands for support and alternate between swaying forward and backward. The activity is performed while balancing on right and left legs.

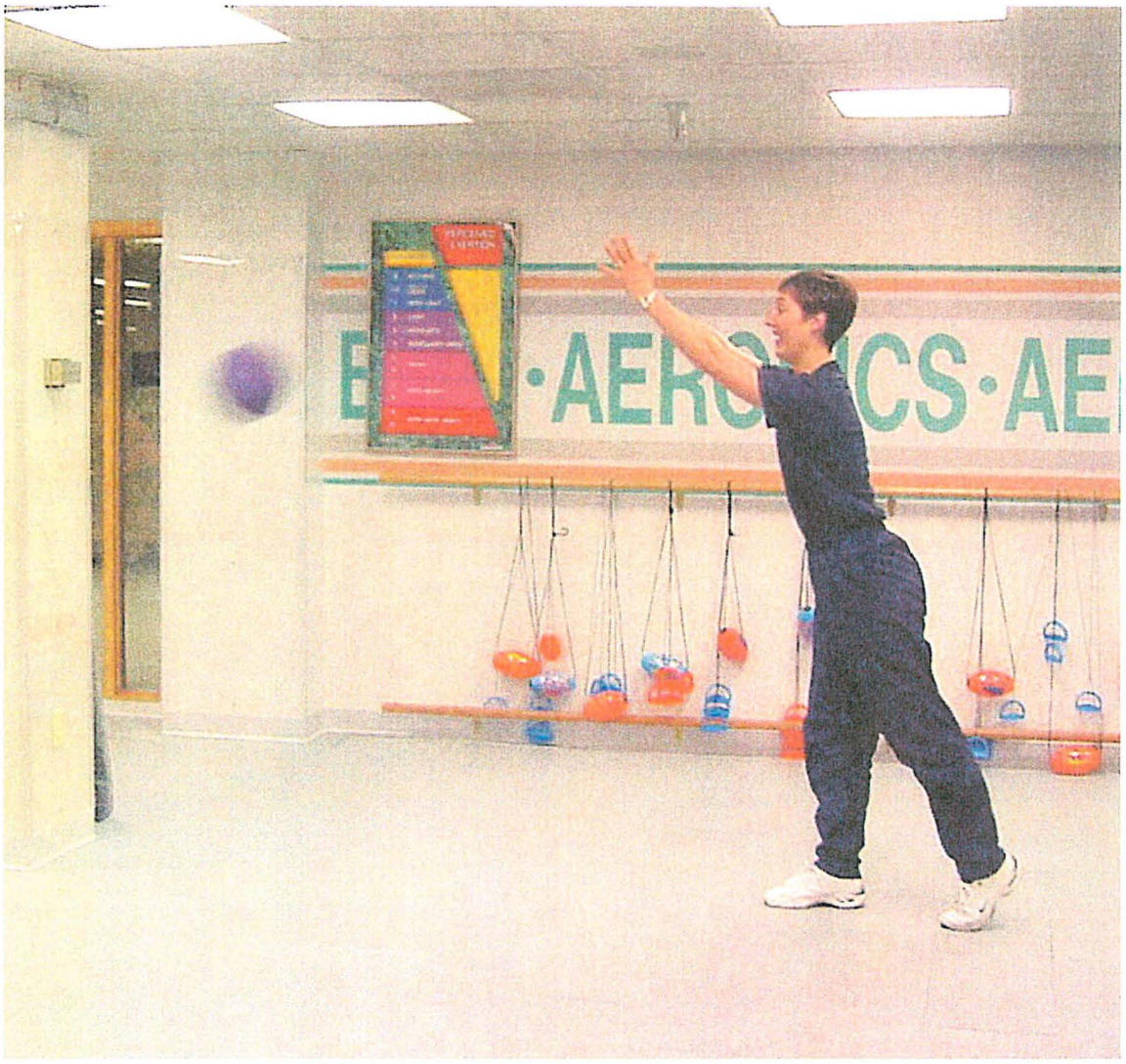

Figure 15. In this activity, participants throw a ball against the wall and catch it as it rebounds back. The ball is thrown with and without a bounce towards the wall.

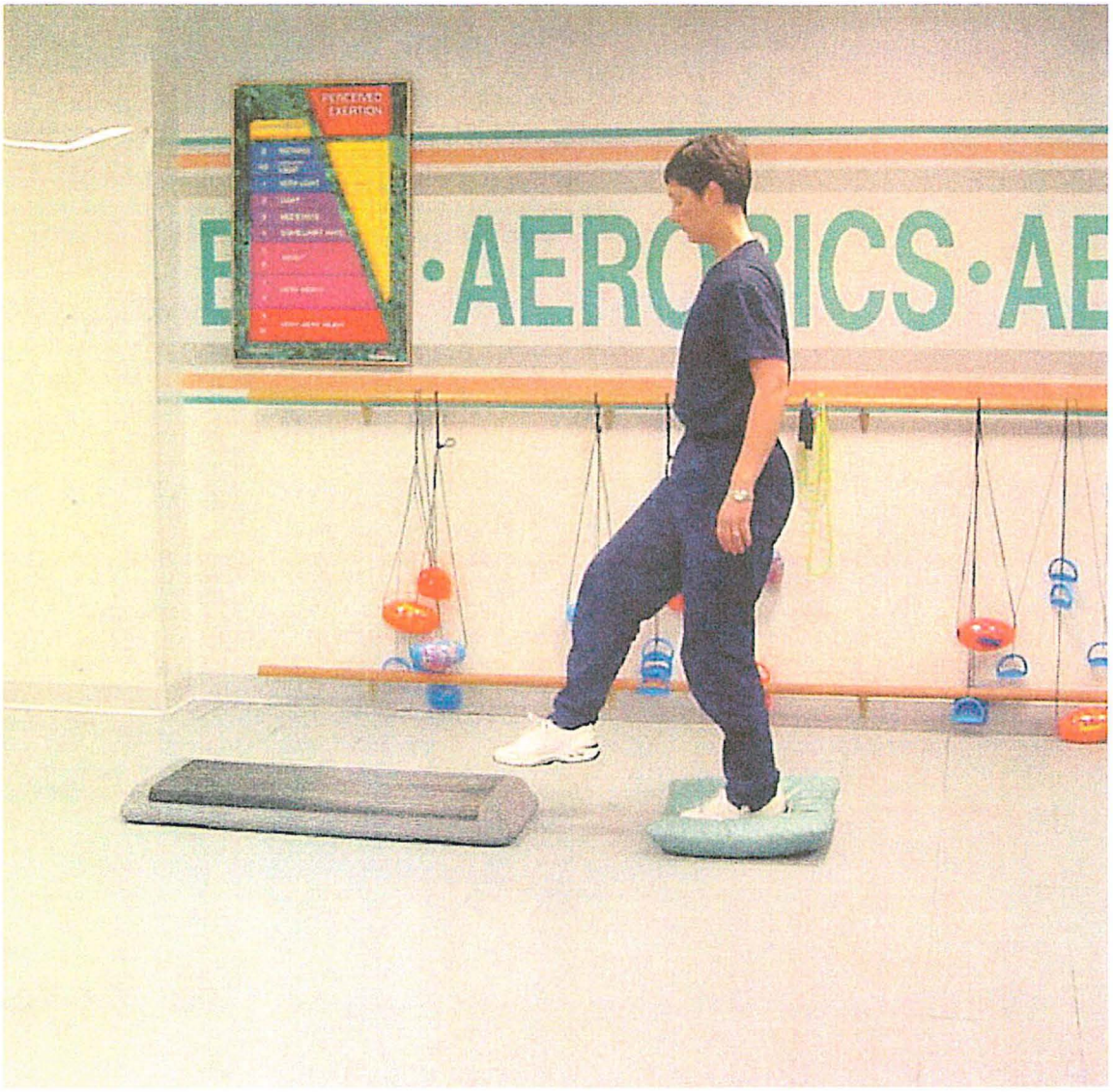

Figure 16. This activity involves walking along an obstacle course of steps and pillows placed in serial order. The goal is for participants to advance from the pillow to the step and to the next pillow without allowing feet to touch the floor.

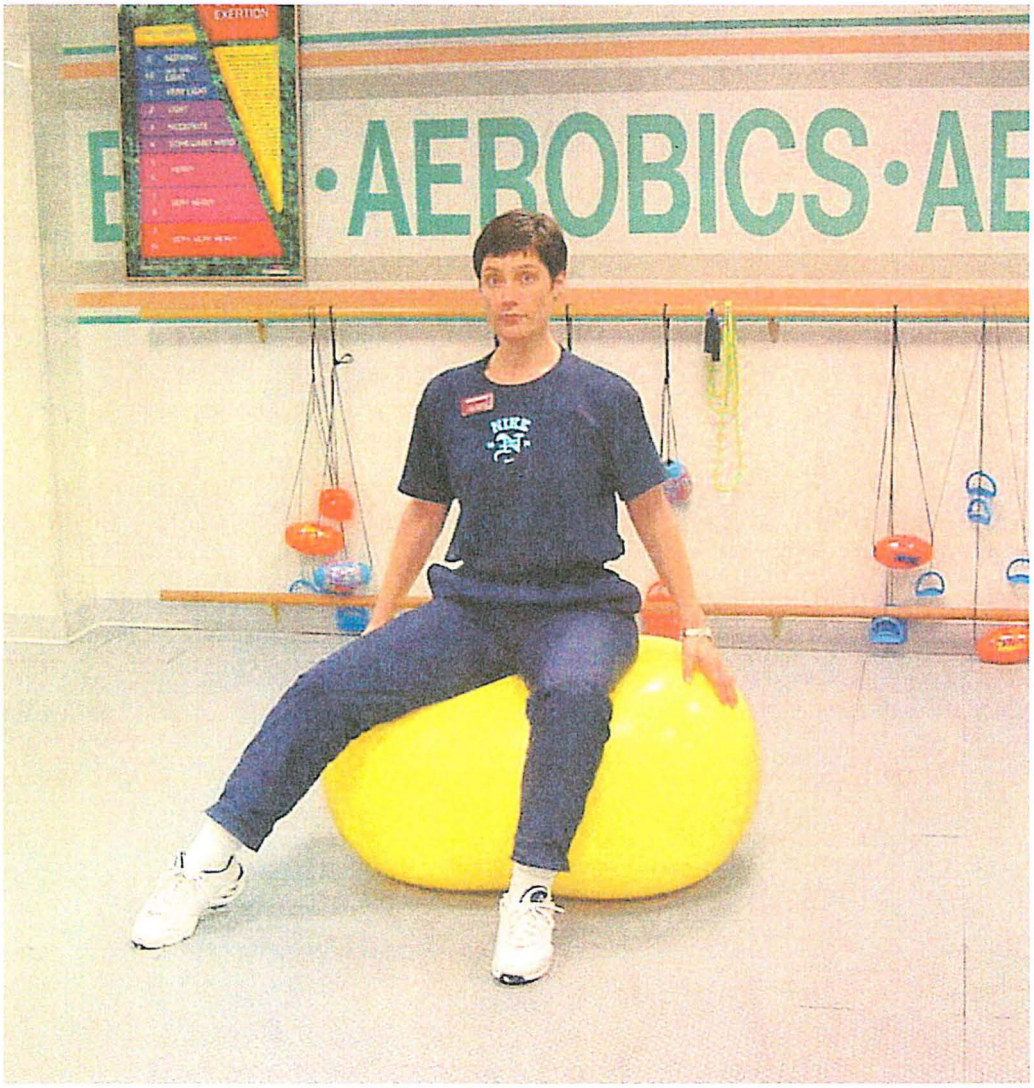

Figure 17. During the "side step," subjects maintain upright posture and balance while seated on the Swiss ball and alternately side step to the right and left.

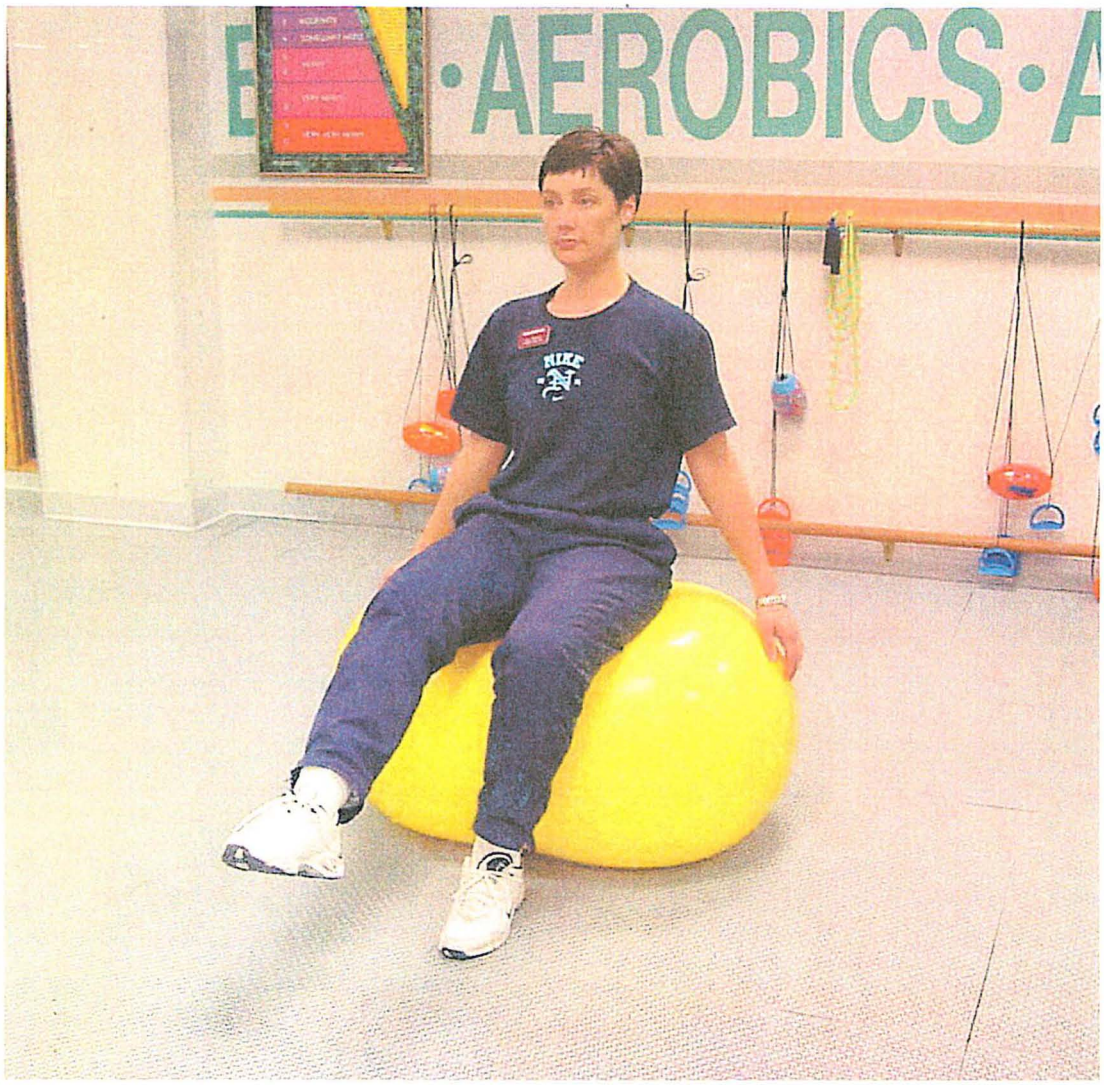

Figure 18. The "kick step" involves maintaining seated balance on the Swiss ball while extending the knee as in a kicking position, alternating between right and left.

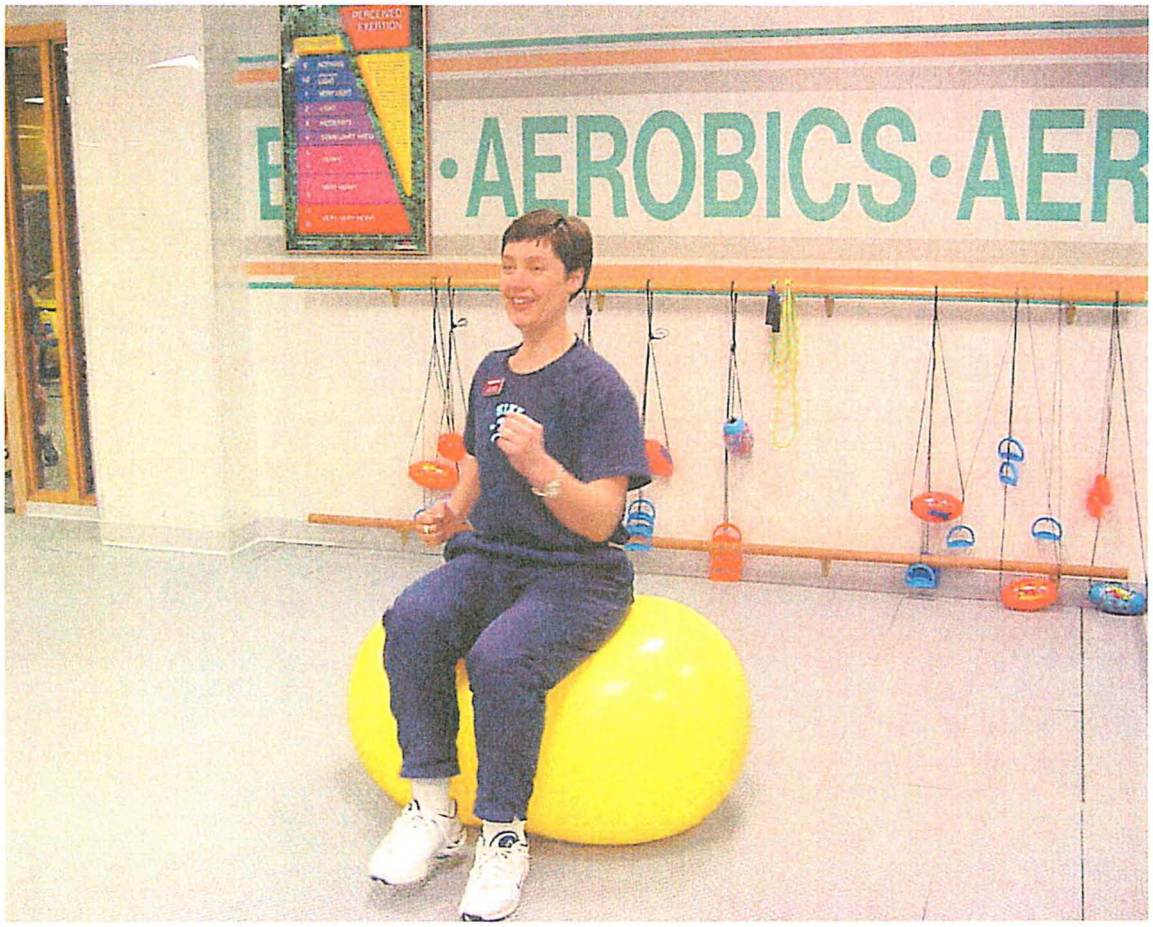

Figure 19. During this activity, participants maintain seated upright balance on the Swiss ball while marching in place with reciprocal arm motion.

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