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Effectiveness of a Practice Regimen for Decreasing Floor Rise Time in Older Adults

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EFFECTIVENESS OF A PRACTICE REGIMEN FOR DECREASING FLOOR RISE TIME IN OLDER ADULTS

by

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ABSTRACT

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Some older adults experience extended periods of time lying on the floor waiting for help to arrive because they can not rise up independently (Campbell et al., 1990; Nevitt, Cummings, and Hudes, 1991). In many of these cases the older adults are not seriously injured, yet they lack the ability to rise up (Tinetti and Speechley, 1989; Vellas, Cayla, Bocquet, Pemille, and Albarede, 1987). Body Recall, an exercise program that teaches floor rising to older adults, advocates practicing getting up from the floor as a method for retaining this ability. The benefit of Body Recall is only anecdotal and has not been examined in a controlled study. Thus, the purpose of this study was to determine if teaching and practicing floor rising skills, such as those described in the Body Recall program, will decrease the time it takes for older adults to rise from the floor.

Nineteen subjects (ten training subjects with an average age of 83.4 years, and 9 control subjects with an average age of 84.8 years) completed the investigation. The training group participated in an exercise class that used the Body Recall technique of teaching floor rising. The class met 3 days a week for 6 weeks and consisted of a warm-up, range of motion exercises and floor rising practice. Measures were taken pre- and post-training to analyze strength, flexibility and floor rise times. After six weeks the training group experienced a significant decrease (42%) in floor rise time. One-repetition maximum (1-RM) scores for leg press and chest press did not change, and sit and reach

scores did not change. The control group did not have any significant changes in the variables, but showed a trend toward an increase in floor rise time. Therefore, a six-week class of floor rising practice proved to be effective in decreasing floor rise time in the study group, without a change in strength or flexibility.

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CHAPTER I

INTRODUCTION

Problem Description

The ability to rise from the floor is a physical task that is taken for granted among the young. However, as the aging process becomes manifest, many people find they can no longer get up from the floor. Floor rising requires a certain amount of agility, strength, coordination and presence of mind. A baby learns to rise from the floor when the above attributes become equal to the task. In the later years of life if these attributes are lost, floor rising becomes difficult and even impossible.

The inability or perceived inability to rise from the floor limits one's quality of life. Nevitt, Cummings, and Hudes (1991) found that among elderly persons experiencing 539 falls, 14% reported lying on the floor for five minutes or longer, with 3% for over 20 minutes, because they could not get up without help. A similar study by Campbell et al. (1990) reported that of 507 falls among elderly subjects, 27 falls resulted in the subject lying on the floor between one and twelve hours waiting for assistance in getting up. Fear of falling can cause an older adult to limit activity, which can lead to a higher risk of falling (Vellas, Cayla, Bocquet, Pemille, and Albarede, 1987). This vicious cycle is debilitating, costly and dangerous.

Only ten percent of falls among the elderly actually result in fractures or other serious injuries (Tinetti and Speechley, 1989). So in the other 90% of cases, rising from the floor would seem to be possible if cognitive and physical abilities are present. However, Tinetti and Speachly found that of 313 elderly people who fell without injury,

only 47% were able to get up without help. Another study by Vellas et al. (1987) found that 84.5% of a group of 59 seniors living in an institution were unable to get up without assistance following a minor fall. If an older person is not confident in his/her ability to rise from the floor, then quality of life and independence become compromised. Transferring in and out of a bath tub or getting on the floor to play with grandchildren, pick up a dropped item, or perform cleaning chores become fearful situations and are avoided. Many seniors also limit other activities such as stair climbing and walking outdoors due to this fear of falling (Vellas et al.). Limited activity leads to deterioration of physical abilities and self-confidence and diminishes the likelihood that one could rise up following a fall.

Floor rising is a great concern among health care providers and the elderly and has become a topic of recent study. Alexander, Ulbrich, Raheja, and Channer (1997) and Didier et al. (1993) both found that older adults took longer than younger adults to rise from the floor. Older men took longer than younger men to rise from the floor, even though both groups had the same caloric expenditure for the task (Didier et al.). Floor rise time did not improve in older women after completing a 12-week program that incorporated low resistance strength training (Skelton, Young, Creig, and Malbut, 1995). A study by Simpson and Salkin (1993) discovered that older adults are not being taught how to rise from the floor as a method of coping with falling. All the studies stated that practicing floor rising may be necessary in order to see improvements.

Dorothy Chrisman (1994), founder and president of Body Recall, Inc., explored the effect of practicing floor rising in her text, *Body Recall: A Program of Physical Fitness for the Adult*. This text gives practical advice on how to get up from the floor.

Included are illustrations and instructions on a variety of floor rising methods. Chrisman advocates practicing these methods regularly so the task becomes more familiar and more possible. She states that if one is to rise from the floor, the body must be able to employ range of motion and skills in such a way as to be able to maneuver on the surface and must have enough strength to push up off the floor. Also required is the coordination needed to combine these skills to produce the desired outcome. Thus, Chrisman developed floor rising strategies that include exercises to develop the strength, flexibility, coordination and balance required for floor rising and for other activities of daily living. To offset dependency, many older adults across America are enrolled in Body Recall classes that practice these techniques regularly.

Statement of Purpose

As the Body Recall program grows and gains popularity, it is important to understand how it affects the participants. Body Recall is the only published exercise program that teaches older adults how to rise from the floor. Its methods should be studied in a controlled setting and assessed for scientific contribution. Dorothy Chrisman developed this program in 1978 from her knowledge of physical education and her observations of older adults. She felt that as long as older adults exercised and practiced daily activities regularly, the loss of ability to perform daily tasks such as floor rising would not be an inevitable part of the aging process. At that time, exercise programs for older adults were rare and even thought to be dangerous. More recently, research has shown that regular exercise is an effective aid for increasing function and quality of life in the older population (Morey et al., 1996). There have been no controlled studies,

however, that specifically investigate the Body Recall method of floor rising and its effect on function. The purpose of this thesis is to determine if teaching and practicing floor rising skills using the methods described in the Body Recall program will decrease the time it takes for older adults to rise from the floor.

A second purpose is to determine the effect of practicing floor rising as described in the Body Recall text on strength and flexibility. Changes in flexibility are expected for the following reasons: First, it must be understood that the Body Recall method of floor rising includes range of motion exercises to be done prior to getting up. These exercises are done to warm up the body and increase suppleness in order to avoid injury. The range of motion exercises alone have the potential to increase one's flexibility. Second, the maneuvering of the body into position so that rising up can be achieved may contribute to increased flexibility. Changes in strength are expected because the act of lifting one's body weight to a standing position is a resistance exercise, particularly for the older adult whose muscles may suffer from disuse. Thus, it follows that a regular program of range of motion exercises and floor rising practice as described in the Body Recall program may increase strength and flexibility in older adults.

Hypotheses

1. The time it takes for older adults to rise from a supine position on the floor to a full stand will decrease after six weeks of instruction and practice.
2. Strength, as determined by a 1-RM chest press and leg press, will improve in older adults who participate in six weeks of instruction and practice in floor rising.

3. Flexibility scores, as determined by a sit-and-reach test, will improve in older adults who participate in six weeks of instruction and practice in floor rising.
4. There will be a positive correlation between the change in floor rise time and the change in strength in older adults who participate in six weeks of instruction and practice in floor rising.
5. There will be a positive correlation between the change in floor rise time and the change in flexibility in older adults who participate in six weeks of instruction and practice in floor rising.

Limitations

This study was limited to adults ages 70 years and older who are able to get on the floor unassisted and can rise up but have difficulty in doing so. The application of the results will be limited only to individuals whose characteristics are similar to the study group.

CHAPTER II

LITERATURE REVIEW

Areas of Research

In order to gain an understanding of older adults' ability to rise from the floor, several areas of research have been reviewed. The following main areas of study were found that contribute to the understanding of an older adult's ability to rise from the floor:

1. Studies that put seniors on the floor and explore their ability to rise
2. Studies of rising from a chair. The chair rise studies primarily cover three areas:
    - Strength associated with rising from a chair
    - Biomechanical analysis of chair rising
    - Time-to-stand tests
3. Studies of range of motion and aging
4. Studies of strength and aging

Rising From the Floor

The previous investigations about adults and their ability to rise from the floor contribute to the understanding of this topic. The Body Recall text, which instructs seniors in how to get up from the floor, is also a useful tool for exploring this topic.

The effect of a 2-week training intervention to improve floor rising ability was assessed on 35 subjects (17 training subjects who's average age was 81, and 18 control subjects who's average age was 80) of a congregate housing facility (Hofmeyer,

Alexander, Nyquist, Medell, and Koreishi, 2002). Before and after the training intervention all subjects were interviewed and then videotaped and timed as they attempted to rise from a supine position. During the interview, subjects were asked questions about concerns they had about rising up from the floor and asked how quickly they thought they could get up. The videotaping and timing of eight floor rising tasks for each subject was recorded. The eight tasks included the following: two from a supine position with no support, two from an all fours position with no support, one from a supine position using a small table for support, one from all fours using a small table for support, one from a supine position using a chair for support, and one from all fours using a chair for support. The training group met with a physical therapist and an exercise trainer for 45 minutes, three days a week, for two weeks. The therapist and the trainer worked with each member of the group, suggesting more efficient strategies for getting up that emphasized the strengths and abilities of the subjects. At each meeting the subjects reviewed and practiced the new strategies in getting up from the floor. The control group also met three days a week for two weeks but did not perform floor rising tasks. Instead they were led through gentle flexibility exercises for the neck, trunk and extremities from a sitting position. A comparison of pre- and post-training scores, results showed that the training group had a significant increase in the number of floor rising tasks that they were successful in performing (base line mean was 6.6, post intervention mean was 7.3). The control groups had no improvement in number of tasks. The floor rise time did not differ from pre- to post-intervention across the different trials or between groups. The results of the questionnaire found that the training group reported less difficulty in rising after the intervention and the control group showed no change.

A study of the biomechanical movements and developmental sequences of adults progressing from supine position to erect stance has found much variability in movement patterns (VanSant, 1988). Subjects studied by VanSant consisted of 32 adults (17 men, 15 women) whose mean age was 28.6 years. Each subject started from a supine position on a mat. On the word 'go' the subject would rise as fast as possible. Each subject performed 10 successive trials. The trials were videotaped and analyzed for repetition of movement patterns and sequential development. The body actions were divided into three components: the upper extremities, the axial region, and the lower extremities. Twenty-one different combinations of component action were found demonstrating a high degree of subject variability. Three core methods of rising were identified, however. They are:

1. Most common method: Symmetrical use of the upper extremities pushing on the floor, rising to a squat with a symmetrical axial region and symmetrical use of the lower extremities in attaining erect stance.
2. Second most common method: Symmetrical use of the upper extremities pushing on the floor, rising to a squat with a symmetrical axial region with asymmetrical use of the lower extremities.
3. Third most common method: Asymmetrical use of the upper extremities with one hand pushing on the floor and the other arm reaching across the body as the axial region rotates, lower extremities go to a half kneel position before attaining erect stance.

VanSant concluded that using the component approach to movement analysis is a useful method of studying floor rising and reveals individual differences in methods of rising.

Expanding on the above study, activity level was examined as a possible contributing factor to floor rising ability. Using the same methods as VanSant (1988), Green and Williams (1992) studied "supine position to erect stance" movements in subjects of varying activity levels. Green and Williams evaluated the rising patterns in 72 adults ages 30-39. The subjects were divided into three groups based on self-reported activity levels, defined as the number of days of vigorous activity performed per week. Group one reported daily physical activity (n=25), group two reported physical activity once or twice a week (n=26), and group three reported physical activity less than once a week (n=21). Each floor rise trial started from a supine position on a mat. On the word 'go' the subject would rise as fast as possible. They were given one practice trial and then ten test trials were videotaped. The movement patterns were categorized using a modified version of VanSant's hypothesized component sequence (VanSant, 1988). The trials were initially screened for any additional categories beyond that described by VanSant. Then, the trials were categorized using the same three movement components, namely: upper extremity, axial region, and lower extremity. Percentages of occurrence for each category were tabulated for each component and activity group. It was found that those subjects who performed the more advanced sequence of movements (the most common method from the VanSant 1988 study) were also the most active group.

Ulbrich, Rahaja, and Alexander (2000) examined the effect of age-related factors and physical impairments on floor rise movement strategies. Three groups were studied and compared: a young control group (YC) consisting of 22 subjects (11 men and 11 women) whose average age was 23 years, a healthy older group (HO) consisting of 24 subjects (12 men and 12 women) whose average age was 73 years, and a group of

congregate housing older adults (CO) consisting of 29 women whose average age was 81 years. Nearly all (83%) of the HO and CO were involved in regular (three days a week) exercise. Subjects were timed and videotaped as they rose from a supine position to erect stance without assistance. In the CO trials, 11 subjects were unable to rise without assistance. Thus the CO group was further divided into CO Able and CO Unable groups for analysis purposes.

Based on the work of VanSant (1988) and Green and Williams (1992) and on videotapes of this study, specific trunk and extremity positions were identified. Ten intermediate positions were identified representing the actions demonstrated in moving from supine position to erect stance:

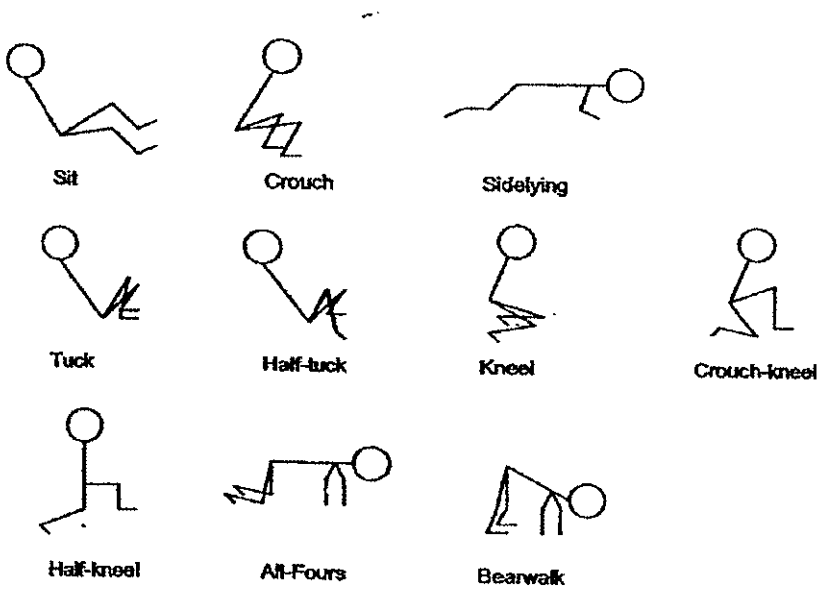

Figure 1. Intermediate positions assumed while rising from supine position to standing. (Ulbrich et al., 2000)

The mean rise time for the HO was 5.5 seconds. This was more than twice that of the YC with a mean of 2.6 seconds. However, the mean number of intermediate positions (2.0 and 2.1 in the YC and HO, respectively) did not differ significantly between these two groups. Mean rise time in the CO Able at 17.1 seconds was more than three times that of the HO. CO Able also had significantly more intermediate positions with a mean of 3.5. The sit and crouch positions were used almost exclusively in the YC. The HO used sit (46%) and crouch (46%) about half the time. The CO Able mostly used the crouch-kneel (89%), all fours (78%), and bearwalk (67%) positions. The CO Unable used the same number of a intermediate positions as the CO Able, but were less likely to use the crouch-kneel and bearwalk positions. The HO incorporated elements of all rise strategies.

These findings support the work of VanSant (1988) who also found that young adults were more likely to stand using the sit and crouch methods (referred to as symmetrical in the VanSant study). With advancing age, floor rise strategies appear to change from "no hands" positions of sit and crouch to positions using floor contact with upper and lower extremities, thus maintaining upper extremity contact with the floor as seen in the crouch-kneel, all fours and bearwalk positions. This suggests that the older subjects may need more contact points to maximize stability and postural control.

The time it takes to rise from the floor was determined to be longer in older adults than younger adults (Alexander et al., 1997). Alexander et al. compared young adults (12 men and 12 women, average age 23 years), healthy older adults (12 men and 12 women, average age 73 years), and congregate housing dwelling older adults (6 men and 32 women, average age 80 years). Five different starting positions were used and each group

was evaluated for floor rise time both with and without support from each position. The starting positions were supine, on the right side, prone, on hands and knees, and sitting. The support used was a 55-cm x 60-cm x 60-cm end table. Timing began when a switch placed under the participant in the starting position was activated by movement, and stopped when the participant pressed a switch on a 0.9-m tripod upon completion of the rise.

Comparison of the groups showed that the healthy old took twice as long to rise as the younger group, and the congregate housing dwellers took two to three times longer to rise than the healthy old. Rise times were 1.4 to 2.6 seconds for the young group, 2.4 to 5.5 seconds for the healthy old group, and 6.4 to 13.2 seconds for the congregate housing dwellers. The authors of the study expressed surprise at finding that use of support did not decrease time to rise. Comparison of the different tasks showed that rising from the hands and knees was performed more quickly for all groups both with and without support. It was concluded that the ability to rise from the floor is impaired in older adults, particularly in those living in congregate living facilities. Developing floor rise strategies and interventions was recommended by the authors as a way to manage falls.

The mechanics of rising from a supine position to a sitting position were found to found to be different in a comparison of 22 young females (mean age 23.5 years) and 17 older females (mean age 73.8 years) (Alexander, Fry-Welch, Marshal, Chung, and Kowalski, 1995). In this study, subjects started from a supine position on a platform that was two meters long, one meter wide, and 0.8 meters high. They were instructed to perform three different tasks at a comfortable rate: First, rise to a seated position with legs off the edge of the platform (as in sitting on the edge of a bed); second, rise to a

seated position keeping their legs on the platform (as in a "sit-up"), using their hands if they wished, and not moving to the edge; and third, rise to a seated position keeping their legs on the platform (as in a "sit-up"), not using their hands and not moving to the edge. One practice trial followed by three additional trials were performed for each task. All trials were videotaped and reviewed in slow motion for analysis. The authors found that the older women were more likely to rotate the hips and use lateral flexion of the trunk to achieve the first position of sitting on the edge of the platform. They were also more likely to use a broader base of support by leaning on an elbow when rising. All of the younger subjects were able to perform both of the "sit up" tasks. However, less than half of the older group could sit up without using their hands. Alexander et al. suggested that decreased trunk flexion ability is accountable for different supine to sitting strategies seen among the groups.

Simpson and Salkin (1993) discovered that older adults who are at risk of falling are not generally being taught how to get up from the floor. They surveyed 214 physiotherapists and 41 occupational therapists in England and Wales who were members of elderly rehabilitation special interest groups. Sixty-seven surveys were returned (38 from physio-therapists and 29 from occupational therapists) and deemed to be usable for collecting data. The researchers determined that social desirability may threaten the validity of the study, so the respondents were not directly asked if they taught older people how to get up from the floor. Rather, they were asked to list the methods they followed in managing instability and fall tendency in older adults and to give details of treatment. Only 11% (four) of the physiotherapists and 21% (six) of the occupational therapists stated that they taught elderly people how to get up from the floor. Of these,

four listed teaching floor rising last on their list of treatments. Simpson and Salkin discuss three possible reasons that most therapists were not teaching floor rising. First, many therapists may not have thought to do so. Second, therapists may desire to avoid the anxiety that some older adults feel at the prospect of getting on the floor, and third, therapists may assume that older adults have emergency alarm systems and therefore think it unnecessary to teach alternative coping methods.

The energetic cost and time requirements of floor rising was investigated by Didier et al. (1993). Two groups of ten men were studied. Older men (age 74.4 $\pm$ 2.2) were recruited from a hiking club that walked an average of about 10 kilometers a week. A younger group (age 24.3 $\pm$ 2.8) was recruited from a school of physiotherapy and reported being moderately active. The study consisted of rising from a chair, a bed and the floor. Each activity was evaluated for time and caloric cost. To determine caloric cost, oxygen consumption was assessed using indirect respiratory calorimetry. Floor rising was evaluated by having the subjects lay supine on a gym mat, rise to a full standing position using any method they choose, and return to the supine position. Time was determined by use of a stopwatch. Timing began the moment movement began and stopped when the subject returned to the starting position. The younger group expended 28.4 $\pm$ 9.3 cal/kg and the older group expended 34.4 $\pm$ 12.1 cal/kg, which was not significantly different. The mean times for the floor rise were 15.6 $\pm$ 1.4 seconds and 25.1 $\pm$ 4.5 seconds for the young and old groups, respectively. This significantly longer performance time in the older group without a significant difference in caloric expenditure was also seen in the task of rising from a bed.

The chair rise task showed different outcomes. Three chair seat heights were used: 35 cm, 45 cm, and 60 cm. The test consisted of getting up and sitting back down on the chair. With the 45 cm and 60 cm chair height, the older subjects had a lower caloric expenditure than the younger subjects without a significant difference in time. With the 35 cm height, the caloric expenditure was also lower in the older group but the times were significantly longer.

Didier et al. (1993) suggested the reason for the different outcomes had to do with familiarity of the task. They suggested a learning process by which subjects find their most efficient speed and pattern of motion, reaching optimal energy expenditure. Rising from a chair of standard height is a task that older subjects perform many times in the course of a day due the need or desire to "get off their feet" while the younger subjects may be more apt to remain standing for longer periods. This repetition of the sit to stand task for older people may lead to increased efficiency, thus explaining the lower caloric expenditure for the older subjects with no real change in time.

The floor and bed rising tasks were a different story. The older subjects did not show a more economic energy expenditure; in fact, the caloric expense was the same as for the younger subjects. The performance times were significantly longer for the older group: 60% longer in the floor rise and 33% in the bed rise. These movements are less often carried out in daily activities. This is particularly true of the floor rise task since many older adults do not get on the floor for days or weeks at a time. Because of the high energy cost, similar in the old and the young, and the longer performance times in the old, the authors surmised that these movements carry a potential for limiting the independence of older adults. They suggested that through practice of the floor rise and

bed rise tasks, older adults could affect the learning process and make these activities more energy efficient, increasing one's ability to live independently.

Another study that included floor rising investigated some of the functional abilities of older women and included a timed floor rise test (Skelton et al., 1995). Skelton et al. studied 40 women ages 75 to 93 years. Twenty women made up a control group, while the other twenty made up a training group and performed 12 weeks of resistance training. Each week the training group had one day of supervised exercise for one hour, and two additional days of unsupervised home sessions. Training consisted of three to four sets of eight repetitions of each exercise using 1.5-kg weights, elastic tubing, and body weight. The authors did not list the specific exercises, but stated that the exercises were designed to strengthen the muscles considered relevant to functional tasks. The measured outcomes were isometric knee extension strength, isometric elbow flexion strength, hand grip strength, and leg extension power. Functional ability tests were chair rise, kneel rise, 118-m self paced walk, stair climbing, step up height, functional reach, lifting weights onto a shelf, and rising from lying on the floor. For the floor rise test subjects were instructed to lie on the floor on their sides. They were then asked to rise to a standing position in their own time without holding on to anything. The faster of two tries was recorded.

Significant increases in all measures of strength were observed after the 12 weeks of training, except for leg extension power. Small but significant improvements were seen in step up height and kneel rise time. The other functional tasks, including floor rise time, did not improve. The authors suggest that improving functional ability may require practice of the actual task, thus explaining the lack of improvement in their study.

The literature on floor rising reveals a strong connection between the ability to rise up from the floor and other factors needed for independent living such as transferring out of bed, recovering from a fall, and having higher activity levels.

In a biomechanical analysis of rising from the floor and from a bed several authors found that older, more frail individuals used both the upper and lower extremities to push up from and steady themselves on a surface (VanSant, 1988; Green and Williams, 1992; and Ulbrich et al., 2000). This usually consisted of starting from a supine position and rolling to one's side and using one or both arms to support the weight of the body. The younger, more fit subjects in these studies all used methods of rising from a supine position that consisted of doing a sit-up-like maneuver, to a squat position and standing without use of the arms and hands.

Both Skelton et al. (1995) and Didier et al. (1993) suggested that practicing the activity of rising from the floor may increase one's ability to do so. Until now this "practice theory" has not been tested in a controlled study. It has, however, been in use in Chrisman's (1994) *Body Recall* program for many years. In classes that are taught across the country, older adults learn various methods of rising from the floor. Each method is designed with a specific purpose. For example, if one is experiencing knee problems, he or she is taught how to go to the floor and get back up without baring weight on, or even bending, the knees.

Chirsman (1994) emphasizes the importance of preparation of the body in order to be successful in lowering to the floor and rising up again. In her text, *BODY RECALL: A Program of Physical Fitness for the Adult*, she advises doing preparation exercises. She states that their purpose is to increase strength and flexibility of the spine, low back, hips,

hamstrings, knees, and shoulders. In the "Falls and Recovery From the Floor" chapter, Chrisman goes on to explain that practice of these exercises along with practicing rising from the floor will equip one with the skills needed to get up from the floor, thus increasing ability and confidence.

Rising From a Chair

Some skills used in chair rising are also required for floor rising (i.e. weight transfer to feet, hip and knee extension, and balance). Chair rising studies offer a comprehensive look at how older adults manage the maneuvering, lifting, and balancing of the body. Chair rising studies appear to fall into three categories: the relationship between strength and chair rising, biomechanical analysis of chair rising, and timed chair rise tests. Following is a review of each category and a discussion of any contribution to the understanding of floor rising in older adults.

Strength and Chair Rising

A reduction in lower extremity strength has been associated with a reduction in chair rise ability and other activities of daily living (ADL) such a walking, stair climbing and floor rising. Investigations into relationships between strength and such activities find that older adults who have difficulty rising from a chair due to muscular weakness, also have difficulty with other ADL.

Brown, Sinacore, and Host (1995) examined the relationship between lower extremity strength and the ability to perform functional activities in 16 older adults ranging in age from 75 to 88 years. Measures of strength were taken for the hip extensors,

hip abductors, knee extensors, planter flexors, and dorsiflexors. Functional activity measures were preferred gait speed, five timed chair rises, and time to complete an obstacle course. A significant relationship was found between strength and function when the combined strength values for hip extension, knee extension and planter flexion were normalized to body weight. It was concluded that lower extremity strength is a factor in the successful completion of ADL. Brown et al. also stated that there are other factors that may limit this success, such as poor balance and fear of falling.

Skelton et al. (1995), reviewed previously, found that a 12-week resistance-training program significantly improved measures of strength in a group of 40 older women. Improved strength, however, did not result in improved chair rise or floor rise times. However improvements were seen in kneel rise time when subjects were asked to move at their own rate. Skelton et al. suggest that improvement was seen in kneel rise time because of an association between kneel rising and isometric knee extension power.

Biomechanical Analysis of Chair Rising

Ikeda, Schenkman, Riley and Hodge (1991) performed a descriptive and well-controlled analysis of sit to stand movements in nine healthy elderly subjects (six men and three women ages 61 to 74 years) and nine healthy young subjects (women ages 25 to 36 years). They studied maximum joint angles, torques, and velocities in both groups from sit to stand. The subjects all started in the same position. The seat height was adjusted to 80% of each subjects knee height. Feet were placed 10.2 cm apart with ankles at 18E of dorsiflexion. They were instructed to stand without using their arms to a time set by a metronome. Subjects practiced until they were comfortable with the instructions.

Data were collected for two trials by use of force plates, optoelectronic cameras and infrared light-emitting diodes.

Great similarities were found between the groups; however, significant differences were found in two areas: head position and trunk-to-pelvis flexion. The older sample had a decreased head-to-trunk maximal angle during the time when the center of mass was shifting from the buttocks to the feet, meaning they were facing downward during weight transfer. The younger subjects had a more upright head position during weight transfer. The older group achieved less trunk-to-pelvis flexion than did the younger group, suggesting less flexibility among the elders and/or that the elders were seated in more of a posterior pelvic tilt.

The author suggested that if head position and trunk-to-pelvis flexion could be adjusted in the older group to match the younger group, then joint angles, torques and velocities required for chair rising would be equal among these groups.

Timed Chair Rise Tests

Timed chair rise tests are widely used in assisted living, nursing care and rehabilitation facilities to determine functional ability in the aging. These tests are generally used to predict the ability of an individual to perform activities such as balancing, getting in and out of bed and the bathtub, and getting off a toilet.

Mathias, Nayak, and Isaacs, 1986) developed the "Get-up and Go" test in 1986 as a measure of balance. This test requires the subject to rise from a chair, walk three meters, turn around and walk back to the chair, and sit down again. Forty men and women who suffered from varying degrees of balance disturbance were the subjects for

this study. Their ages ranged from 52 to 94 years with an average age of 73.8 years. After a familiarization trial, one test trial was videotaped. Sway and gait patterns were also measured for each subject. Groups of observers from various medical professions viewed the tapes and rated balance for each subject on a five-point scale. It was found that the observers were in agreement on the subjective scores and that these scores correlated highly with clinical measures of balance, thus deeming the "Get-up and Go" test a valid measure of balance in the elderly.

More recent research on chair rise tests investigates their validity as reliable predictors of functional ability. Podsiadlo and Richardson (1991) modified the "Get-up and Go" test which they called the "Timed Up and Go." This modification was found to be a reliable predictor of functional ability and frailty in older adults. They studied 60 community dwelling seniors whose average age was 79.5 years. Each subject was evaluated for a "Timed Up and Go" score. This score was recorded as the time in seconds it took for the subject to stand from a standard chair (seat height of 46 cm), walk three meters, turn, walk back to the chair, and sit down. Each subject was also evaluated for his or her ability to climb stairs, go outside alone, and for his or her independence in transfers such as moving from a chair to a bed, getting on and off the toilet, and in and out of a bath tub or shower. The subjects were divided into three groups according to their "Timed Up and Go" scores; less than 20 seconds, 20 to 29 seconds, and 30 seconds or more. Those who had a score of less than 20 seconds were found to be independent for transfers and most were able to climb stairs and go outside alone. Those who took 30 seconds or more were found to be much more dependent. This group needed help with most transfers and only one of them was able to climb stairs without assistance. None

could go outside alone. Podsiadlo and Richardson concluded that their "Timed Up and Go" test is a reliable and valid test for determining functional ability in older adults.

Lundin-Olsson, Nyberg, and Gustafson (1998) expanded on the "Timed Up and Go" by adding a manual task to be performed during the walking portion of the test. They studied forty-two subjects (30 women and 12 men) whose mean age was 79.7 $\pm$ 6.1 years. Each subject performed the "Timed Up and Go" as described in the study by Podsiadlo and Richardson (1991). The subjects then performed the test again but were instructed to pick up a cup of water from a table that was placed next to the chair after they rose, carry the cup while walking, and place the cup on the table again before siting down. The difference in the time of the two tasks was recorded. The subjects were monitored for a six month period after the testing and all falls were recorded. It was found that the subjects who had a larger difference in the time of the two tasks were more likely to fall in the six-month period. The authors of the study stated that this method of testing would be a good predictor of frailty and risk of falling in older adults.

Range of Motion in Older Adults

An aspect of aging that may affect one's ability to rise from the floor is a loss of range of motion (ROM). Authors have demonstrated this loss and its relationship to loss of ability. In a cross-sectional study of 109 male subjects, Boone and Stanley (1979) found that there were notable differences in ROM between children (ages one to nineteen) and adults (ages twenty to fifty-four). Hip rotation decreased 15 to 20 degrees per decade during the first twenty years of life and by 5 degrees per decade there after. It

was also found that ankle and knee flexion and foot eversion were less in the adults than in the children.

Walker, Sue, Miles-Elkousy, Ford, and Trevelyan (1984) conducted a study designed to describe the active ROM in the extremities of older adults. Their sample included 30 men and 30 women ages 60 to 84 years. All subjects were living independently in their homes. The beginning and ending positions for the following joints on the right side were measured: shoulder, elbow, hip, knee, radioulnar, wrist, ankle, subtalar, and first metatarsophalengeal. Comparison of the results showed that women had greater ranges of motion than men in four areas: hip medial rotation (+14 degrees), ankle plantar flexion (+11 degrees), shoulder abduction (+20 degrees), and shoulder extension (+11 degrees). Women had less motion than men in hip adduction (-7 degrees) and ulnar deviation (-5 degrees).

Rider and Daly (1991) found that older women were able to increase spinal mobility through flexibility training. They noted that loss of spinal mobility with age appears to be a function of a sedentary lifestyle, and that flexibility training could prevent this loss. They studied 20 women whose average age was 71.8 years. Each subject was tested prior to the study for spinal flexion using a sit and reach test, and for spinal extension using the 'distance of chin from table top' test. The women were divided into two groups. A control group of ten subjects was established and was instructed to continue with their normal activity program but not to participate in flexibility exercises. A study group was formed of the other ten women who underwent a ten-week (three days a week) program of spinal flexibility exercises. The exercises included were sit and reach, knees to chest, pelvic lift, and back extension. Each exercise was done three to five

times per session and was held for at least ten seconds at a time. At the end of the ten week training session all subjects were again evaluated for trunk flexion and extension.

The results for spinal flexion on the sit and reach test were that the control group had an average of 25.4 (± 7.7) cm on the pre test and 24.7 (± 7.2) cm on the post test, and the study group had a significant increase with an average of 28.4 (± 8.8) cm pre and 32.6 (±6.6) cm post. The results for spinal extension were the control group had an average of 19.1 (±4.8) cm on the pre test and 20.3 (±5.2) cm on the post test, and the study group had a significant increase with an average of 17.9 (±5.3) cm and 25.1 (±5.1) cm pre and post respectively. The conclusion drawn was that older women can improve spinal mobility with just three days a week of flexibility exercises.

Strength in Older Adults

Lower extremity strength and balance were investigated for their contributions to the task of chair rising by Schenkman, Hughes, Samsa, and Studenski (1996). The study was conducted using older adults (29 men and 29 women whose ages ranged from 66 to 96 years) who demonstrated some level of functional impairment but who were still able to rise from a seated position without assistance. This population was determined to be at risk of losing independence due to the possible impending loss of chair rising ability.

Chair rising was analyzed and compared to strength and balance measures. Chair heights ranged from 33 to 58 cm. Kinematic characteristics of sitting to standing were measured from the lowest successful chair rise height for each subject. Also measured were walking distance in six minutes (mean of 222 m), functional reach (mean of 26.4 cm), and time of sit-to-stand task (range from 1.8 to 7.5 seconds). Maximum hip flexion

angular velocity ranged from 17 to 136 degrees per second, and vertical velocity of center of mass ranged from 82 to 119 cm per second.

A significant relationship was found between lower extremity strength and lowest possible seat height (the lowest seat height that one can rise from without assistance) (r = -0.639). A significant relationship was also found between balance (as measured by the functional reach test) and lowest possible seat height (r = -0.374). The authors stated the reason they found a strong correlation between strength and chair rising was because the subjects all displayed some degree of functional impairment. They predicted that if this study were replicated with younger adults whose lower extremity strength is well above the threshold needed for chair rising, there would not be such a high correlation.

A strength training program for frail older adults was found to be beneficial for increasing the ability to perform functional tasks and improve strength (Sullivan, Wall, Bariola, Bopp, and Frost, 2001). A sample consisting of 19 subjects (14 male and 5 female) who resided in either a rehabilitation unit of a Veterans Hospital or a transitional care unit of a nursing home were studied. The mean age of these subjects was 82.8 years and all had experienced a recent decline in their level of physical functioning. The protocol consisted of progressive resistance training, using leg press machines, three days a week for a ten-week period. Each day the subjects performed three sets of eight repetitions per set with a three to five minute rest between sets. Week one was used for familiarization, teaching of proper lifting technique and functional testing. Functional tests included a timed sit-to-stand test, distance walked in 20 seconds, and body composition. During the first day of week two, one repetition maximum (1 RM) for leg extension was determined for each participant. On days two and three of week two the

subjects trained at 50% of 1 RM. Weeks three through ten started with the subjects at 80% of 1 RM. The weight was increased after each set as tolerated by the subject. On the last day of week ten, functional, 1 RM and body composition tests were repeated.

Improvement was observed in all areas. Seventy-nine percent of the group showed significant improvements in the sit-to-stand times. On initial testing six subjects were unable to rise and at final testing all could do so. Fifty-three percent showed significant improvement in the gait speed test, with four subjects who were unable to complete the 20 second walk initially, being able to do so upon completion of protocol. Leg strength increased by an average of 79% and all but two subjects increased leg strength by greater than 20%. The authors determined that these results indicate that progressive strength training, if carefully monitored, is a safe and effective method for frail older adults to regain functional abilities.

CHAPTER III

METHODOLOGY

Subjects

Subjects were recruited from residents of The Chesapeake Retirement Community in Newport News, Virginia. One hundred sixty five questionnaires were distributed along with a flyer soliciting participation (Appendix A). The flyers and questionnaires were placed in the in-house mail boxes of independent living and assisted living residents. Requirements for participation were:

1) Age 70 years or older
2) Reported being able to get down on the floor and rise up without assistance
3) Reported that getting up from the floor is more difficult than it used to be
4) Reported being able to tolerate kneeling
5) Able to follow simple directions

Forty-two questionnaires were returned, and of these 23 residents met the inclusionary criteria, were available to participate, and were accepted as subjects for the study. All 23 resided in independent living quarters.

The subjects meet as a group with the primary investigator. They were given a verbal description of the investigation, an opportunity to ask questions, and they signed informed consent documents (Appendix B). During this meeting each subject's height and weight were measured and an appointment was made with each subject, for later that same week, to obtain time-to-stand, sit and reach, 1-RM leg press and 1-RM chest press baseline scores. Subjects were matched based on age, gender, and time-to-stand. The

matched sets were divided and randomly assigned to either the control group or the training group.

The training group initially consisted of 12 subjects (4 male). Two female subjects dropped out, one due to a fall (unrelated to the study) that resulted in the subject attending physical therapy, and the other due to surgery. The remaining ten training subjects consisted of four males and six females whose average age was 83.4 years.

The control group initially consisted of eleven subjects (5 male). One female subject moved out of the area and was therefore dropped from the study. One male underwent surgery during the investigation period and was also dropped. The remaining nine control subjects consisted of four males and five females whose average age was 84.8 years.

Measurements

Each subject was evaluated for time-to-stand, sit-and-reach, 1-RM leg press and 1-RM chest press scores during the week immediately preceding and following the six-week training program.

Sit-and-reach was measured first by assessing how far the subject could reach toward, or past, his or her toes in a sitting position on the floor with the knees fully extended and soles of the feet placed on a surface perpendicular to the floor. The sit and reach score was reported to the nearest half centimeter with the 23-cm mark being placed at the toes.

Time-to-stand was measured next. Subjects were shown a variety of methods of rising from the floor and allowed two practice trials prior to taking the test. The time-to-

stand test was performed by having each subject start in a supine position, with the hands resting beside him or her on a mat. Directions were given that the subject should rise at the fastest rate that was confortable. On the word "go" timing was started and the subject began to rise using any method he or she chose. The subjects were encouraged to reach a full standing position with erect posture. The investigator gave verbal encouragement near the end of the task by saying "full stand." Timing was stopped when the investigator observed an erect posture position. The subjects were not allowed to have assistance in rising up, such as the use a chair or the wall to pull up on. The best of three tries was recorded.

1-RM leg press was evaluated next using an Atlantis leg press variable resistance machine. The seat was adjusted to its maximum distance from the weight stack for all subjects. While this made the task relatively easier for shorter subjects, the same position was used in pre- and post-testing, making within-subject comparisons valid. Each subject was instructed to warm up by doing ten repetitions with a light weight. The subjects then attempted one repetition of a heavier weight of the investigator's choosing. If the attempt was successful, more weight was added in 25 lb increments. This trial and error method was continued until the maximum weight that could be lifted in one repetition was determined.

1-RM chest press was evaluated using a Nautilus S2 chest press variable resistance machine. The seat height was set so that the handles were even with the middle of each subject's chest. Each subject was instructed to warm up by doing ten repetitions with a light weight. The subjects then attempted one repetition of a heavier weight of the investigator's choosing. If the attempt was successful, more weight was added in 5 or 10

lb increments. This trial and error method was continued until the maximum weight that could be lifted successfully in one repetition was determined.

For both of the 1-RM tests the subjects were given verbal encouragement by the investigator in words such as "very good" and "you did it." The subjects were instructed to only do as much as they could without pain and they were told they could stop at any time. The actual 1-RM score was achieved in five or fewer attempts.

Training Protocol

Overview

The training group met with the investigator, who was a certified Body Recall instructor, three days a week for a period of six weeks. The subjects were led through flexibility and floor rise exercises. Details of the exercises are described below.

The control group was instructed to maintain a normal level of activity and not practice getting up from the floor during the study period. The 6-week training class was offered to the control group at the conclusion of the study, but results of this secondary trial are not included in this report.

Procedures

During the training sessions, the training group performed the following exercises as described in the Body Recall text (Chrisman, 1994).

1. Three to four minute walking warm up
2. Wrist circles (slow controlled movement, four circles each direction)
3. Ankle circles (slow controlled movement, four circles each direction)

4. Hand press (hands held at chest level with palms together, slide heel of right hand up to finger tips of left hand and push fingers back gently, hold stretch for 10 seconds, repeat 3 times)
5. Large arm circles (slow controlled movement, four circles each direction)
6. Standing forward lean (hamstring and low back stretch) with hand support on chair seat (hold stretch for 10 seconds, repeat 3 times)
7. Supine low back stretch/double knee to chest (hold stretch for 15 seconds, repeat 4 times)
8. "Supine-to-stand" movements practiced between 2 and 5 times depending on each subject's level of fatigued. The subjects were shown various methods of rising in the first two weeks; they were encouraged to try the different methods and to determine if one was easier for them than another. Once they discovered their best method, they were asked to practice that method each time they came to class. Rest was allowed as needed between repetitions.

Statistical Analysis

Statistical calculations were performed using Excel and SPSS. Four dependent variables measured during two trials were tested: time to rise, leg press 1-RM, chest press 1-RM and sit-and-reach. The subject characteristics were reported as mean plus standard deviation. Characteristics were compared between subject groups using an independent t-test. Two-way (group and time) repeated measures (on one factor, time) ANOVAs were used to determine the presence of significant difference between the two trials. The alpha level was set at 0.05.

CHAPTER IV

RESULTS

Table 1 presents characteristics of the subjects who completed all phases of the study including age, height and mass. There were no significant differences in any of these variables between groups. A total of 18 classes were held for the training group and the average attendance was 15.7 classes.

Table 1. Subject Characteristics (mean + SD)

	Age (yr)	Ht (cm)	Mass (kg)
Training group	83	164	65.1
	± 4.7	± 10	± 10.8
Control group	85	165	66.6
	± 6.6	± 11	± 10.8
p	0.603	0.840	0.777

Table 2 presents the pre-investigation and post-investigation mean values for the dependent variables; time to rise, leg press 1-RM, chest press 1-RM and sit and reach for both the training group and the control group. There was no difference in floor rise times between groups during the pre-testing. The numerically greater (but non-significant) value for the control group was due to a member of the experimental group who had a very slow floor rise time dropping out. Following training, there was a large (42%) and highly significant ($p = 0.001$) decrease in floor rise time in the experimental group, and a trend ($p = 0.087$) for a slight increase (6%) in floor rise time in the control group. These changes are illustrated in Figure 2. There were no significant changes in leg press 1-RM, chest press 1-RM or sit and reach for either group.

Table 2. Pre and post test results (mean + SD)

	pre test results				post test results			
	Time (sec)	Leg 1-RM (kg)	Chest 1-RM (kg)	Sit & Reach (cm)	Time (sec)	Leg 1-RM (kg)	Chest 1-RM (kg)	Sit & Reach (cm)
Training group	8.3	97	31	19	4.2	102	32	19
	4.4	26	10	12	2.1	24	9	8
p, pre to post					* 0.001	0.299	0.785	0.608
Control group	13.1	77	29	11	14.0	81	30	10
	10.1	19	9	13	10.6	17	10	13
p, pre to post					0.087	0.438	0.500	0.589
p, between groups	0.191	0.076	0.608	0.179				

* Indicates a significant change

Figure 2 presents the difference in floor rise times at pre and post testing, and illustrates the difference between groups.

Figure. 2 Floor Rise Times

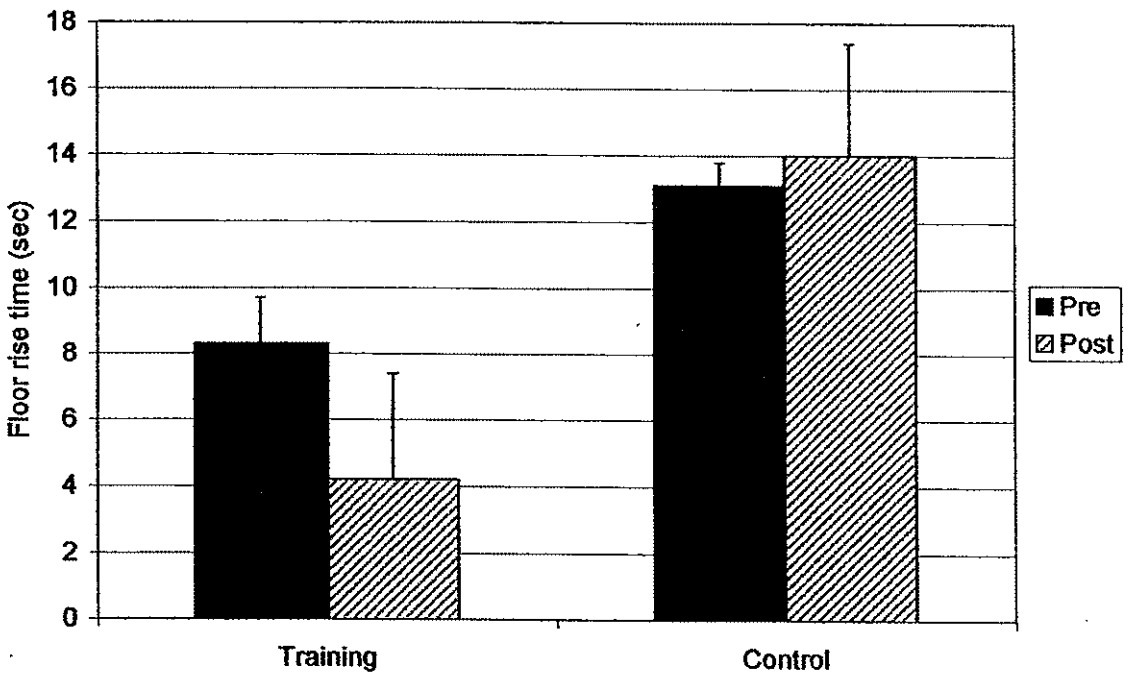

Table 3 presents the percentage of decrease in floor rise times from pre testing to post testing for each subject, and the average percentage decrease for each group. A trend for greater improvement in those with longer initial times was found ($r = 0.563$, $p = 0.090$).

Table 3. Percentage of decrease in floor rise times from pre to post

Group	Subject ID	Percent decrease	pre test	post test
Training	Subject 9	49%	18.80	9.50
	Subject 11	47%	11.00	5.80
	Subject 10	47%	10.10	5.40
	Subject 1	43%	6.30	3.60
	Subject 4	43%	6.10	3.50
	Subject 3	41%	4.40	2.60
	Subject 7	41%	9.80	5.80
	Subject 5	38%	5.80	3.60
	Subject 8	30%	4.00	2.80
	Subject 6	21%	7.00	5.50
average		42%	8.33	4.81
Control	Subject 12	17%	5.80	4.80
	Subject 19	-1%	13.40	13.50
	Subject 16	-3%	38.00	39.20
	Subject 21	-3%	8.80	9.10
	Subject 14	-5%	15.00	15.80
	Subject 18	-6%	7.80	8.30
	Subject 20	-7%	5.70	6.10
	Subject 15	-23%	8.00	9.80
	Subject 22	-25%	15.30	19.20
average		-7%	13.09	13.98

CHAPTER V

DISCUSSION

Subjects in the training group of this study experienced a significant decrease in floor rise time, while the subjects in the control group did not experience a decrease, and even showed a trend toward an increase. These findings support the initial hypothesis and demonstrate that the Body Recall method of teaching older adults to rise up from the floor was effective in the training group.

The decrease in floor rise time found in the current study differs from the results of Hofmeyer et al. (2002), who found no improvement in floor rise time in their two-week study. There are two apparent reasons for this difference. First, the subjects of the Hofmeyer study reported requiring assistance in performing at least one mobility-related task of daily living. In the current study, the subjects were able to rise from the floor independently. Thus, the current participants may have entered the investigation with a higher level of fitness.

The second important difference between the Hofmeyer et al. (2002) study and this one, when reviewing the variable of time-to-rise, is that this study spanned six weeks, providing an additional 4 weeks over the Hofmeyer study in which the subjects practiced floor rising. In the first two weeks of the current study, the subjects seemed to be just getting familiar with the actions needed to rise up. Some of them did not remember from one session to the next the techniques that were taught. After week two, the subjects no longer needed reminders of the techniques, and they appeared to begin getting up more

easily. These observations could support the notion that older adults may require practice to achieve familiarity with the action of rising from the floor. Thus, in the first two weeks of a program such as the Hofmeyer investigation and this one, a period of adjustment may be expected and may explain why Hofmeyer et al. did not have see a change in floor rise time. Others have suggested that practicing getting up from the floor may be important for older adults in order to maintain this ability (Alexander et al. 1997; Didier et al. 1993; Skelton et al. 1995; and Simpson and Salkin 1993). In contrast, Skelton et al. (1995) did not include practicing getting up from the floor in their 12-week investigation. Their study, that examined the effects of resistance training on daily functions including floor rising, consisted of resistance training using 1.5-kg weights, elastic tubing, and body weight. The subjects had no change in floor rise time even though measures of strength improved.

The investigator of the current study observed two main phases that presented physical challenges to the subjects of the training group in practicing the floor rise task. The first phase was maneuvering the body from a supine position into an intermediate position (intermediate positions have been previously described by Ulbrich et al. (2000). After achieving an intermediate position, the second phase was the task of up righting, and balancing the body to achieve erect stance. When examining the first phase, some of the subjects initially attempted to flex the spine in order to go from a supine position directly to siting position using a 'sit-up' technique. They found this extremely difficult, probably due to weak abdominal muscles. Others rolled to a side lying position but were unsure of how to place their hands and feet to proceed with rising up. During the first week of training, the investigator suggested that they roll to a side-lying position and

draw the knees toward the chest as described in the Body Recall text (Chrisman, 1994). Instruction was given and demonstrated in placement of the upper and lower extremities so that the subjects could achieve an intermediate position. Following these instructions, the subjects found it easier to proceed to either the crouch-kneel, half kneel, all-fours, or bear walk intermediate positions, from which they could continue the task of rising without having to do a sit up.

The second phase, that of up righting and balancing the body to achieve erect stance, was a difficult task for many in the training group. This was most apparent in three of the ten members of the group who had the slowest rise times. The floor rise times for these three were 10.1, 11.0 and 18.8 seconds at the time of the pre-intervention measures. During the first few weeks of training, the investigator noticed these three having more difficulty than the others in extending the knees, hips and back while maintaining balance during the up righting phase. In the last few weeks of the training, however, these three appeared to have increased their skill in this second challenge. The post-investigation floor rise times for these three were 5.4, 5.8 and 9.5 seconds respectively. Since the two phases of getting up were not separately timed and analyzed, it is impossible to clearly state where the greatest decreases in rise time occurred. However, based on the observations of the investigator, there may be a reason to further study these phases and how each phase impacts total time.

The second hypothesis states that improvements in strength, in older adults who participate in six weeks of floor rising practice, were expected. However, there was no significant change in strength as measured by the 1-RM leg and chest press tests. This finding is of particular interest because strength has been suggested to be a major

contributing factor in the functional independence of older adults. Note that the leg strength measures were obtained with a 1-RM test on a variable resistance machine. The machine had a weight stack that increased by 25 lb (11.4 kg) increments. It is possible that if the training subjects gained strength, the improvement was not enough to allow them to press and additional 25 lb during the testing. The chest 1-RM testing was available in 5 lb (2.3 kg) increments. These smaller increments may have been enough to detect a change in strength; however, no change in chest 1-RM was observed.

A widely accepted fact in resistance training is that much of the initial improvements seen in a beginning strength-training program are a result of neural adaptations. These adaptations include number of motor units recruited, a lowering of neural inhibition, and coordination of the firing sequence of nerves (McArdle, Katch, and Katch, 1996). The floor rising intervention training was specific to the task of getting up from the floor; therefore, it is reasonable to surmise that the neural adaptations were specific to the task. The task of floor rising for older adults, who have not been on the floor regularly in recent months, may require such neural adaptations. It could be possible that neural adaptations played a major roll in increasing the training group's floor rise time. These adaptations would be specific to the task and therefore would not necessarily translate to an increase in 1-RM scores.

The third hypothesis states that improvements in flexibility, in older adults who participate in six weeks of floor rising practice, were expected. However, there was no significant change in flexibility as measured by the sit and reach test. These findings are in contrast to those of Rider and Daly (1991). Their study found a significant increase in sit and reach scores in older women after ten weeks of flexibility training. The women in

the Rider and Daly study were about ten years younger than those in the current study, and they also trained for ten weeks as opposed to six. These factors may account for the different results. Additionally, there are many other factors that affect flexibility including joint structure, age, sex and activity levels. Even though the training intervention included flexibility exercises, it is possible that the flexibility of the older adults in the current study was more affected by joint structure, pain, and age than by the exercise intervention.

Hypotheses four and five stated that there would be a positive correlation between the change in floor rise time and the change in strength, and between the change in floor rise time and the change in flexibility in older adults who participate in six weeks of instruction and practice in floor rising. Since significant changes in strength and flexibility were not found, then these hypotheses were not supported by this research.

Floor rising is an important task for older adults. The results of this study indicate that older adults who have similar characteristics to this training group can improve floor rising ability. The fact that these results are possible, even in the absence of improvements of strength and flexibility, should be encouraging to older adults who have a fear of remaining of the floor for extended periods of time after a fall. Practicing rising up from the floor appears to be an important factor in improving such ability.

Further research is warranted in this area. Studying the effects of continued practice, beyond six weeks, may reveal changes in strength and flexibility. An investigation into the two phases of rising, mentioned previously, may give more insight into how to teach these tasks more effectively, and where the most improvements can be made. A look at how one's balance is affected by practicing floor rising may be valuable

in preventing falls. Research in the floor rising in older adulthood has only just begun. Countless senior citizens may be able to maintain or regain this ability. Scientists and exercise professionals should continue to strive for an understanding of active independence and the ability to get up following a fall.

We Need You!

A research study is being conducted at
The Chesapeake Retirement Community.

This study is designed to help older adults get up from the floor. You could be involved in helping countless other adults be more independent! If you choose to participate you will be involved in a six-week class using the Body Recall approach to getting up from the floor.

Schedule

January 6: Orientation session
January 7 - 11: First round of measurements
January 13 - February 21: 6-week class meets 3 days per week
February 24 - 28: Second round of measurements

To be eligible you do NOT need to be good at getting up! Just fill out the attached questionnaire and you will be contacted with more information.

The results of this study will be included in Debbie Gibbs Master's Thesis at Old Dominion University and possibly published nationally.

If you have any questions please contact
Debbie Gibbs at ext 4417.

Your Participation is Greatly Appreciated!

Floor Rise Study Questionnaire

Thank you for your interest in the "Floor Rise Study." Please answer the following questions that will help determine your eligibility to participate.

1. Name: _____ *Please Print*		
2. How old are you? _____ *Age*		
3. Are you physically able to get down on the floor?	Yes	No
4. Are you physically able to get up from the floor?	Yes	No
5. Is getting up from the floor more difficult than it used to be due to stiffness, weakness, fear or any other reason?	Yes	No
6. Can you tolerate kneeling?	Yes	No
7. Have you ever fainted when getting up from the floor or a chair?	Yes	No

Please return form to Deborah Gibbs in the wellness office or call extension 4417.

Thank you

INFORMED CONSENT DOCUMENT
OLD DOMINION UNIVERSITY

PROJECT TITLE: Effectiveness of a practice regimen for decreasing floor rise time in older adults.

INTRODUCTION
The purposes of this form are to give you information that may affect your decision whether to say YES or NO to participation in this research, and to record the consent of those who say YES. The research project titled "Effectiveness of a practice regiment for decreasing floor rise time in older adults" will be conducted at The Chesapeake Retirement Community in the multi-purpose room.

RESEARCHERS
Deborah W. Gibbs, BS in Sports Medicine, Old Dominion University department of Exercise Science, Sport, Physical Education and Recreation

Dr. David Swain, Professor, Old Dominion University department of Exercise Science, Sport, Physical Education and Recreation

DESCRIPTION OF RESEARCH STUDY
Some studies have found that many older adults who fall cannot get up even though they are not significantly injured. Some older adults lie alone on the floor for long periods of time. An exercise program that involve practicing floor rising might increase an older persons ability to rise up.

If you decide to participate, then you will join an eight-week study of the effectiveness of an exercise regimen for rising up from the floor. You will be assigned to either the study group or the control group. If you are in the study group, your strength, flexibility and the time it takes you to rise up from the floor will be assessed during week one. In weeks two through seven, you will participate in a 3-day per week exercise class involving walking, stretching and floor rising. Each class will last about 30-35 minutes.

In week eight measures of your strength, flexibility and the time it takes you to rise up from the floor will be taken again. If you are in the

control group, you will only participate in the measures of strength, flexibility and the time it takes you to rise up from the floor in weeks one and eight. At the conclusion of the study, the control group will be given the opportunity to take the six-week exercise class. The class will be held at The Chesapeake Retirement Community and approximately 30 older adults will be participating in this study.

EXCLUSIONARY CRITERIA

You must be at least 70 years of age. You should have completed the "Floor rise study questionnaire." To the best of your knowledge, you should be able to get up and down from the floor (even though it may not be easy), tolerate kneeling, and have never fainted while getting up from the floor or a chair.

RISKS AND BENEFITS

RISKS: If you decide to participate in this study, then you understand that you may face a small risk of injury. You might strain a muscle, and if you fell you might experience a bruise or fracture. The researcher tried to reduce these risks by including appropriate warm up exercises, allowing you to move at a pace that is comfortable for you, and providing mats to exercise on. And, as with any research, there is some possibility that you may be subject to risks that have not yet been identified.

BENEFITS: The main benefit to you for participating in this study is you may increase your ability to maneuver on the floor and safely rise up. If you are in the control group you will be offered the same training at the conclusion of the study.

COSTS AND PAYMENTS

The researchers want your decision about participating in this study to be absolutely voluntary. Yet they recognize that your participation may pose some inconvenience due to the time commitment. The researchers regret that you will receive no payment to help defray incidental expenses associated with participation.

NEW INFORMATION

If the researchers find new information during this study that would reasonably change your decision about participating, then they will give it to you.

CONFIDENTIALITY

The researchers will take reasonable steps to keep private information, such as questionnaires and test results, confidential. The researcher will store information in a locked filing cabinet prior to its processing. The results of this study may be used in reports, presentations, and publications; but the researcher will not identify you. Of course, your records may be subpoenaed by court order or inspected by government bodies with oversight authority.

WITHDRAWAL PRIVILEGE

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time. Your decision will not affect your relationship with The Chesapeake Retirement Community, or otherwise cause a loss of benefits to which you might otherwise be entitled.

COMPENSATION FOR ILLNESS AND INJURY

If you say YES, then your consent in this document does not waive any of your legal rights. However, in the event of injury arising from this study, neither Old Dominion University, the researchers, nor The Chesapeake Retirement Community are able to give you any money, insurance coverage, free medical care, or any other compensation for such injury. In the event that you suffer injury as a result of participation in any research project, you may contact the principal investigator, Deborah Gibbs at 223-1624, or Dr. David Swain at 683-6028, or the Old Dominion University Office of Research and Graduate Studies at 683-3460, who will be glad to review the matter with you.

VOLUNTARY CONSENT

By signing this form, you are saying several things. You are saying that you have read this form or have had it read to you, that you are satisfied that you understand this form, the research study, and its risks and benefits. The researchers should have answered any questions you may have had about the research. If you have any questions later on, then the researchers should be able to answer them:

Deborah W. Gibbs, 757-223-1624
Dr. David Swain, 757-683-6028

If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should call the Old Dominion University Office of Research and Graduate Studies at 757-683-3460.

And importantly, by signing below, you are telling the researcher YES, that you agree to participate in this study. The researcher should give you a copy of this form for your records.

Subject's Printed Name & Signature	**Date**

INVESTIGATOR'S STATEMENT

I certify that I have explained to this subject the nature and purpose of this research, including benefits, risks, costs, and any experimental procedures. I have described the rights and protections afforded to human subjects and have done nothing to pressure, coerce, or falsely entice this subject into participating. I am aware of my obligations under state and federal laws, and promise compliance. I have answered the subject's questions and have encouraged him/her to ask additional questions at any time during the course of this study. I have witnessed the above signature(s) on this consent form.

Investigator's Printed Name & Signature	**Date**

APPENDIX C

Raw Data
Floor Rise Study Data Pre-investigation Measures

Training group	Age	Ht. (in)	Wt. (lbs)	Time (s)	1RM leg(lbs)	1RM chest (lbs)	Sit & Reach (cm)
Subject 1	83	68	145.5	6.3	200	95	18
Subject 3	82	60	148	4.4	300	70	26
Subject 4	79	65	142.5	6.1	225	60	24
Subject 5	82	67	159	5.8	175	80	-5.5
Subject 6	81	64	165	7	150	50	24
Subject 7	81	63	132	9.8	250	60	37
Subject 8	82	68	175	4	250	100	16.5
Subject 9	91	60	105.5	18.8	125	35	13
Subject 10	93	71	159	10.1	275	90	
Subject 11	80	59	104.25	11	175	45	16
Average	83.40	64.50	143.58	8.33	212.50	68.50	18.78
Control Group							
Subject 12	78	73	108	5.8	225	100	15
Subject 14	82	68	170	15	200	80	-15
Subject 15	88	68.5	173.5	8	150	70	-5
Subject 16	83	61.25	171	38	175	65	12.5
Subject 18	79	63	120	7.8	100	35	11
Subject 19	84	63.75	132	13.4	150	50	14
Subject 20	79	64.5	158	5.7	225	75	29
Subject 21	94	63	152	8.8	150	40	17
Subject 22	96	59	136	15.3	150	55	17
Average	84.78	64.89	146.72	13.09	169.44	63.33	10.61

Raw Data
Floor Rise Study Data POST-investigation Measures

Traning group	Age	Ht. (in)	Wt. (lbs)	Time (s)	1RM leg(lbs)	1RM chest (lbs)	Sit&Reach (cm)
Subject 1	83	68	142	3.6	225	70	19
Subject 3	82	60	148	2.6	300	80	25
Subject 4	79	65	142.5	3.5	250	65	27
Subject 5	82	67	158	3.6	225	95	-3
Subject 6	81	64	158	5.5	150	55	21.5
Subject 7	81	63	134	5.8	250	65	32
Subject 8	82	68	174	2.8	300	90	17
Subject 9	91	60	107	9.5	150	35	14
Subject 10	93	71	158.5	5.4	200	95	
Subject 11	80	59	105	5.8	200	45	16.5
Average	83.40	64.50	142.70	4.81	225.00	69.50	18.78
Control Group							
Subject 12	78	73	108	4.8	225	115	14.5
Subject 14	82	68	170	15.8	200	70	-15
Subject 15	88	68.5	173.5	9.8	175	70	-5
Subject 16	83	61.25	170	39.2	175	65	12.5
Subject 18	79	63	120	8.3	100	40	9
Subject 19	84	63.75	132	13.5	200	55	17
Subject 20	79	64.5	158	6.1	175	70	28
Subject 21	94	63	153.5	9.1	150	40	17
Subject 22	96	59	136	19.2	200	60	15
Average	84.78	64.89	146.78	13.98	177.78	65.00	10.33

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