Outcomes of Stages of Change for Physical Activity in a Falls Prevention Clinic

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ABSTRACT

Combest TM, Jarrett E, Forster C, Pinholt, E. Outcomes of Stages of Change for Physical Activity in a Falls Prevention Clinic. JEPonline 2011;14(4):29-40. The purpose of this study was to examine the stages of change (SOC) for regular moderate physical activity among older adults in a shared medical Falls Prevention Clinic. A secondary purpose was to determine if progress towards increased physical activity and strength occurs in this setting. Thirty-one subjects (20 women and 11 men) aged 64 to 94 yrs old (mean age = 80 yrs) participated in this study. A physical activity questionnaire for SOC was given the first and last sessions. Strength measurements of hip flexion and knee extension were assessed. The Timed Up and Go test (TUG) was used to measure functional ability. The percentage of subjects that progressed through 1 SOC = 16.1%, 2 SOC = 38.7%, combined 1 and 2 SOC = 51.6%, and 3 SOC = 12.9%. There was a significant increase in strength in hip flexion from an average of 32.8 lbs (SE = 2.0 lbs) to 37.3 lbs (SE = 1.8 lbs), p = 0.003 (n = 26) and leg extension from an average of 26.6 lbs (SE = 2.1 lbs) to 33.3 lbs (SE = 2.2 lbs), p = 0.001 (n = 26). Median TUG was 12 secs at baseline and the median 1 sec improvement was significant at p=0.019 (n=15). Progress for SOC for physical activity and improvement in strength occurred. The shared medical appointment was an effective setting for exercise physiology intervention. Regular visits helped to increase outcomes.

Key Words: Behavior Change and Physical Activity, Falls Prevention Clinic, Shared Medical Appointment, Older Adults
INTRODUCTION

Falls constitute an important health concern for older adults because a fall may lead to soft tissue injuries, fractures and other complications, and a decrease in daily living activities as well as a decrease in independence and even death. Due to these potential consequences to older adults after a fall, the medical community continues to rank fall prevention as a patient safety goal and conduct studies to reduce the number of falls.

Exercise has been shown to be an important and effective intervention in reducing falls and the risk of falling (6,7,24). However, adopting an exercise routine can be difficult. It also involves a behavioral change. An individual’s motivation or readiness for change is an important factor in determining whether he/she will make the effort to change (16). Change does not occur as a single event. Rather, it is a process that develops over time (16). Change interventions are especially useful in addressing lifestyle modification for disease prevention and long-term disease management (22,23,32). For example, the Stages of Change (SOC) Model has been applied to a broad range of behaviors including weight loss and injury prevention. The SOC Model has been found to be an effective aid in understanding how people go through a change in behavior. In this model, change occurs gradually and relapses are an inevitable part of the process of making a lifelong change (15). The SOC model is based on the premise that people are at different stages of motivational readiness for engaging in health behaviors and that intervention approaches are most useful when they are matched to a person’s current stage of change (17). The five SOC are:

1. **Precontemplation**: The stage at which there is no intention to change behavior in the foreseeable future. Many individuals in this stage are unaware of their problem or do not acknowledge the benefits of the behavior change.

2. **Contemplation**: The stage in which people are aware that a problem exists and are seriously thinking about overcoming it but have not yet made a commitment to take action.

3. **Preparation**: The stage that combines intention and behavioral criteria. Individuals in this stage are intending to take action in the next month and have unsuccessfully taken action in the past year.

4. **Action**: The stage in which people modify their behavior, experiences, or environment in order to overcome their problems. Action involves the most overt behavioral changes and requires considerable commitment of time and energy.

5. **Maintenance**: The stage in which people work to prevent relapse and consolidate the gains attained during action (22,23).

Reed et al. (25) developed a “stages” of change algorithm for physical activity that has been shown to be helpful in assessing a person’s current intent to participate in physical activity (Figure 1). The stages consist of five questions that measure the “stages of change” in regular physical activity. The questions are consistent with the US Surgeon General Centers for Disease Control and Prevention and the standard recommendations for physical activity (5,18,19).

Several studies have shown that assessing a person’s SOC for physical activity is important and can help improve health behavior (2,4,8,9,11-13,19,20,26,29). Also, it is important to identify the SOC toward a health behavior so that one can better match strategies relevant to that particular SOC to increase physical activity. Most of the studies have focused on various age groups but not specifically on subjects aged 64 and older. The inactive older adult is at increased risk of falls, and yet has the ability to increase physical activity (exercise).
Falls prevention studies have given us a great deal of information on exercise interventions that are effective in decreasing falls in the elderly, but have not addressed the SOC in their subjects (6,28,29). Identifying the SOC towards physical activity and tailoring health behavior interventions in older adults should lead to an increase in physical activity behavior (exercise). Studies have shown that older adults that are more physically active have less falls than their sedentary counterparts (3,6,14,21). Thus, the purpose of this study is to fill the void in studies that have failed to assess SOC for physical activity in a among older adults in a shared medical Falls Prevention Clinic.

**METHODS**

**Subjects**
This study consisted of a retrospective chart review using a computerized medical health record of a Falls Prevention Clinic over a one year period of time. Subjects attended the Falls Prevention Clinic at Walter Reed Army Medical Center, Washington, DC. They were referred to the clinic by their primary care providers in the Walter Reed Health Care System. The subjects were at risk for falls or had fallen in the last year. The number of subjects consisted of 20 women and 11 men, aged 64 to 94 yrs old with the mean age of 80 yrs old. This study was approved by the Walter Reed Army Medical Center Institutional Review Board.

**Procedures**
Subjects attended a 90-min shared medical appointment focused on falls prevention for three consecutive weeks. The appointment was structured to provide the older patients with education from multiple health care providers including a geriatrician, nurse, optometrist, pharmacist, psychologist, and exercise physiologist (Figure 2). They received fall prevention information related to low vision.
and proper lighting, a review of medications that may have an impact on falls, home safety and assistive device instruction, fear of falling and strategies to overcome this fear, and detailed exercise instruction all in an interactive shared medical format.

The exercise program consisted of chair-based exercise instruction by the exercise physiologist that included knee extension, hip flexion, sit to stand, isometric hip abduction and adduction, and calf raises. The exercises were consistent with the standard recommendations in older adults for muscular conditioning of 2 to 3 days a week on non-consecutive days with 1 to 2 sets of 8 to 10 reps (19). The subjects also received written packets with educational material as well as the National Institute of Health’s exercise booklet: *Your Everyday Guide from the National Institute on Aging:*
Exercise & Physical Activity, Publication #09-4258. In addition, the subjects were evaluated in accordance to the following outcome measures during the first and third session:

**Timed Up and Go Test (TUG)**
The subject rose from a chair and walked forward 10 feet at his or her normal walking pace and turned at a 180 degree angle and walked back to the chair and sat down. The subject was timed with a stopwatch when rising from the chair and upon sitting back down in the chair. The test was done at visits 1 and 3 at the clinic. The TUG has been shown to be an effective and reliable measurement of mobility and functional ability (10,14,31). A time in the TUG test of less than 12 sec has been shown to indicate normal functional mobility.

**Strength test**
Muscle strength was assessed with a BASELINE Hydraulic Push-Pull dynamometer. The strength of subject’s quadriceps was tested during leg extension and hip flexion. Strength was registered in pounds (lbs) and was taken at visits 1 and 3 at the clinic. The subject was asked to push as hard and as long as he or she could against the dynamometer. He/she was given two trials to determine the best measurement (1,30). As a point of reference, the average strength for knee extension in an asymptomatic male aged 70 to 79 is approximately 80 lbs, and for a female it is 50 lbs (1). The average strength during hip flexion for males is approximately 36 lbs and 23 lbs for females (1).

**Stages of Change Physical Activity Questionnaire**
The Stages of Change Physical Activity Questionnaire was administered to gather the subject’s current physical activity level and SOC towards implementing exercise into their lifestyle at the first session and the last session at the clinic. The questionnaire consisted of 5 questions that assessed physical activity recommendations for older adults. Scoring instructions were provided according to the participant’s answers. The questionnaire has been validated and found to be reliable for older adults (2,4,5,18,19,27).

**Statistical Analyses**
The subjects’ measurements were statistically analyzed using the first session and the third session data to look for change in strength, TUG, and SOC. Differences in hip and leg strength for each side before and after the clinic were analyzed using repeated measures Analysis of Variance. The change in TUG was examined using the Wilcoxon Signed Ranks test. The proportion of subjects in each stage of change is presented with 95% confidence intervals.

**RESULTS**

The highest percentage of patients was found to be in the “contemplation” stage at the start of their involvement with the clinic and following the three week exposure to the clinic, excluding those in “maintenance” (n=19): moved to the action stage (95% CI .5324-.8774) (Figures 3 and 4.) Patients progressed through at least 1 stage of change: 16.1%, 2 stages: 38.7%, combined 1 and 2 stages: 51.6% and, lastly, 3 stages: 12.9%. There was a significant increase in lower body strength in both groups from before and after the clinic (P=0.05, refer to Figure 5.) However, there was no significant increase in strength in the hip flexion in men (P=0.26) from an average of 37.3 lbs to 39.7 lbs. There was a significant increase (P=0.003) in strength in hip flexion in women from an average of 29.6 lbs to 35.9 lbs. There was no significant difference in the right side versus the left side in hip flexion in men or the women (P=0.84). There was a significant increase in strength in knee extension in the men from 30.9 lbs to 36.2 lbs (P=0.017). There was a significant increase in strength in knee extension in the women from 23.4 lbs to 30.8 lbs (P=0.008). There was no significant difference in the right versus the left side in knee
extension in the men or the women (P=0.74). Median TUG was 12 seconds (range: 7 to 24 sec) at baseline and the median 1 second improvement (range: 10 sec faster to 4 sec slower) in TUG was statistically significant, p=0.019 (n=15.)

Figure 3. Stages of change for physical activity at the first visit of a falls clinic.

Figure 4. Stages of change for physical activity at the third visit of a falls clinic.
DISCUSSION
Stages of Change and Physical Activity
Advancement in just one stage of change (SOC) is a great accomplishment towards meeting a goal behavior and a desired outcome. The older patients took great interest and involvement in the clinic and felt motivated to change their behavior. They demonstrated a significant progression towards the action SOC with the majority of patients progressing two stages over a three week time period. For example, individuals in the contemplation stage, a stage in which people are aware that a problem exists and are seriously thinking about overcoming it, but have not yet made a commitment to take action, progressed to action, a stage in which individuals modify their behavior.

This progression towards the action stage compares well with findings of Shiraki et al. (29) in a slightly younger population aged 40 to 65 yrs old in that, at 2 weeks, 52.5% of the patients moved two stages from precontemplation (no intention of being physically active) to the preparation stage (trying but not regularly active) and at 12 weeks 67.2% of the patients moved three stages to the action phase. The subjects, in addition to increasing in the stages of change of physical activity, also made significant improvements in lower body strength and balance.

Figure 5. The average strength increase in the lower extremities before and after a falls clinic.
Cameron et al. (4) designed a single cohort pilot program in which home care subjects (ages not described) volunteered to receive an active approach to home care and were encouraged to increase personalized physical activity plans. The SOC for exercise behavior was measured but no physical measurement of fitness was performed. The subjects progressed towards one stage of change in physical activity in 11 of the initial 31 subjects during the 6-month period. Four of the subjects progressed more than two SOC, and a majority of the subjects started in the contemplation stage. The subjects did show an increase in measures of daily functioning such as grooming and reaching.

Greaney et al. (11) published findings from the Study of Exercise and Nutrition in Older Rhode Islanders (SENIOR) Project in 2008. The SENIOR Project consists of 966 subjects 60 yrs of age or older. The subjects were randomized into two groups (control and treatment). The treatment group received SOC specific written materials and counselor calls to promote increased exercise. When the participants who were already in the maintenance SOC (i.e., who were maintaining exercise activity for over a 6 month period) were excluded, the intervention group progressed in stage while the control group remained stable or regressed in stage. The most important progression was in the precomtemplation phase. By comparison, regarding the present study, when the subjects in the maintenance phase were excluded, it was evident that the greatest progression in SOC occurred in the beginning two stages of the model (i.e., precontemplation and contemplation). These studies (4,11,29) and the findings in the present study should encourage the health care provider to work with sedentary older adults even though they may indicate lack of desire to increase their activity (the precontemplative stage).

Functional and Strength Comparisons
The TUG results show a significant decrease in median time of 1 sec, which compares with other studies that looked at exercise to reduce falls (3,10,14,20). The decrease of 1 sec placed the subjects under 12 sec and into normal functional mobility. Riebe et al. (26) compared precontemplation TUG to maintenance and found a difference of 3 sec (26). The decrease in TUG is clinically important in helping older adults to maintain functional mobility, especially those at a greater risk of falling (10,14,20). Perell et al. (20) studied the outcomes of a consult falls prevention clinic over a 3 month period of time and found a 1.8 sec decrease in an 8 foot timed up and go test.

The measurement of lower body strength during knee extension and hip flexion provided an objective assessment of the subjects’ strength potential that could also be compared over time. As noted in Figure 5, the subjects improved in both their hip and quadriceps strength. Lord et al. (13) found after an extensive falls prevention program lasting 6 months (with interventions that included exercise, maximizing vision and sensation) that the subjects increased their knee extension strength from 23.5 kg to 24.3 kg. Their finding is higher than the present study, but it was measured over a 6-month period of time. The improvement in knee extension strength, although measured in lbs now expressed in kg for easier comparison, of 12.1 kg to 15.1 kg occurred in just a 3-week period of time. The more rapid strength improvement in the present study may be due to the subjects being at a higher risk of falling with a lower initial strength in the knee extension and hip flexion. Whitney et al. (31) performed measurements on community dwelling elders in a falls clinic (n=110) to determine quadriceps strength and found that the mean knee extension strength of a large older adult sample was 19.1 kg ± 8.5, which is higher than the findings in this study. However when subdivided into levels of falls risk, the high falls risk group’s (n = 48) knee extension strength was 16.9 kg. This strength measurement in the high falls risk group is comparable to the findings in the present study after 3 visits.
Our subjects progressed in both SOC and functional improvements with a majority of the subjects progressing two stages during a 3-week period of time. One should note that the maintenance stage (performing the desired behavior over a 6-month period) is a more stable behavioral stage. Patients in the maintenance stage have incorporated exercise into their life and would not be expected to move in the cycle except to perhaps the relapse stage. As in the findings of Greaney et al. (11) and Cameron et al. (4), our maintenance subjects were thus excluded for analysis after visit number 3.

Limitations
There are three limitations of this study. First, the subjects were not followed over a longer interval. A follow-up of 6 months would verify that the exercise behavior was sustained. Second, the exercise logs were not collected to document physical activity. The subjects performed the exercises at home and no tracking methods were used to verify physical activity. But the results of improved strength and decrease TUG argue in favor of the subjects’ increased physical activity. Third, the exercise information presented in the shared medical appointment was not tailored to each subject’s SOC. Progress in SOC was observed without a targeted approach. The shared medical appointment setting itself, with older subjects learning from each other as well as from the staff may have had a positive influence on our subjects and their decision to become more physically active.

CONCLUSIONS

Falls in the elderly continues to be a major health care concern, and exercise will be important in preventing falls and fractures. As health care providers, exercise physiologists must not be discouraged by the sedentary behavior of the elderly patients. This study demonstrates that change in exercise behavior with a corresponding improvement in strength is possible when providers promote exercise and give the proper guidance. Also, it is important to point out that the shared medical appointment setting gave the subjects even more self-efficacy to make changes in their exercise habits. To our knowledge this is the first study that addressed the subjects’ SOC for physical activity in a shared medical falls clinic. The shared medical appointment was an effective setting for exercise physiology intervention and regular visits helped to increase positive outcomes. More studies are needed to further address this connection between health behavior change and falls prevention over a longer period of time.

ACKNOWLEDGMENTS

We want to extend our appreciation to Gail Robinson, RN of Walter Reed Army Medical Center for coordination and implementation of the falls prevention clinic.

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