Published in final edited form as:
Int J Nurs Stud. 2013 September ; 50(9): 1156–1165. doi:10.1016/j.ijnurstu.2012.12.006.

Outcomes of a Peer Mentor Implemented Fitness Program in Older Adults: A Quasi-Randomized Controlled Trial

Sandor Dorgo, Ph.D.[1] **[Associate Professor]**, **George A. King, Ph.D.**[1] **[Associate Professor]**, **Julia O. Bader, Ph.D.**[2] **[Research Specialist]**, and **John S. Limon, BS**[1] **[Graduate Research Assistant]**

[1]Department of Kinesiology, University of Texas at El Paso, El Paso, Texas, 79968, USA

[2]Statistical Consulting Laboratory, University of Texas at El Paso, El Paso, Texas, 79968, USA

Abstract

Objectives—To investigate the effectiveness of different applications of mentoring in an older adult exercise program, this study compared the physical fitness scores, the retention and participation rates of older adults trained by student mentors, peer mentors, peer mentors working independently of the researchers, and a non-exercising control group.

Methods—106 older adults were recruited and assigned to one of the groups using quasi-randomization. All three experimental groups completed a 14-week intervention. Pre- and post-training assessments of fitness were completed, and retention and participation rates were compared.

Results—High retention and participation rates, as well as significant improvements in fitness scores from baseline to post-test were observed in all three mentored groups. While the control group showed improvement only in one fitness test, subjects in the mentored groups improved similarly in all measures, regardless of the type of mentoring received.

Discussion—These findings indicated effectiveness of the peer mentor model and suggested that with adequate preparation peer mentors may be capable of guiding older adult participants effectively without assistance from professional staff.

Keywords

elderly exercise; layperson leadership; older adult fitness; peer counseling

Introduction

Recent U.S. estimates indicate that only about 13% of adults age 65 or older participate in vigorous physical activity regularly (Center for Disease Control and Prevention, 2011). As most older adults lack the necessary knowledge and experience to exercise alone (Grove & Spier, 1999; Schutzer & Graves, 2004), they typically need individual attention and possibly professional guidance to engage in regular physical activity (Buman et al., 2011; O'Neill &

Corresponding Author: Sandor Dorgo, UTEP - Department of Kinesiology, 1851 Wiggins St., El Paso, TX 79968, Phone: +1 (915) 747-7222, Fax: +1 (915) 747-8211, sdorgo@utep.edu.

Reid, 1991; Schutzer & Graves, 2004). However, the typical community-based older adult exercise program lacks any type of professional assistance or social support (CDC, 2011). Consequently, many of these individuals never initiate regular physical activity participation or drop out early on.

Previous reports indicated that with adequate social support exercise participation, retention, enjoyment, and level of fitness may be improved among older adults (Kahn et al., 2002; McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003; Walcott-McQuigg & Prohaska, 2001). Strategies for social support may include building social networks, creating one-on-one support from an exercise specialist, or setting up a "buddy" system between peers. However, many older adults either lack access to exercise specialists with the necessary expertise (Bratter & Freeman, 1990; CDC, 2011; Grove & Spier, 1999) or do not have the funds to work with these professionals (Belza et al., 2004; Bratter & Freeman, 1990). Also, most exercise programs focusing on older adult fitness do not utilize any type of peer or social support system (van der Bij, Laurant, & Wensing, 2002).

An alternative and cost-effective solution to hiring fee-based fitness professionals is to prepare and employ older adults as volunteer peer mentors (Buman et al., 2011). Through adequate amount and quality of training peer mentors or laypersons may be able to acquire the skills necessary to mentor others (Kirkpatrick & Patchner, 1987). Although peer mentors have been used in some older adult health promotion programs (such as Active Start, Active Choices, Enhance Wellness, Healthy Changes, Healthy Moves for Aging Well, Matter of Balance, and Women Take Pride), there have been only a few studies conducted in this area. Layne and colleagues (2008) implemented the peer mentor (peer leader) model in an older adult strength training program and reported success and positive changes in the outcome variables. Study findings from our laboratory also indicated that the peer mentor model can be effectively used to engage older adults in regular exercising, and to improve participants' physical fitness and perceived overall function (XXX, 2009; XXX, 2009; XXX, 2011). A recent study by Castro and colleagues (2011) showed that trained peer mentors were effective in promoting regular physical activity among inactive older adults through telephone-based consultation. Buman and colleagues (2011) successfully implemented a peer-mentor based older adult physical activity program in a community setting. However, other findings suggested that the lack of adequate preparation for the peer mentor applicants and the application of spontaneous peer leadership or unorganized peer support resulted in poor retention or no fitness improvement (Gillett, White, & Caserta, 1996; Grove & Spier, 1999).

On the contrary, studies using trained and somewhat experienced peer mentors reported high exercise program participation rates or suggested effectiveness of the peer mentor model (Buman et al., 2011; Castro et al, 2011; Layne et al., 2008; XXX, 2009; XXX, 2011). Furthermore, these studies reported that peer mentors were able to learn the basic principles of exercise supervision, were able to follow previously designed fitness programs and guide inexperienced older adult participants to correct movement execution. Nonetheless, previous research has not investigated whether peer mentors are capable of independent design and implementation of an exercise program. The present study aimed to investigate the effectiveness of a group of peer mentors to improve the fitness of older adult participants without any guidance from professional staff. This group was compared to a group of peer mentors and a group of young professionals (student mentors) following prescribed exercise programs, as well as a non-exercising control group. Our hypothesis was that with adequate training peer mentors could demonstrate the ability to retain older adult intervention participants and improve their fitness similarly to other peer mentors and student mentors who followed a prescribed program. The purpose of our study was to document and compare the retention and participation rates, as well as the changes in physical fitness in

four groups of older adults: 1) a group trained by peer mentors who were working independently from the researchers and were responsible for the entire program design and implementation process; 2) a group trained by peer mentors who followed a prescribed program designed by the researchers, 3) a group trained by qualified student trainers who also followed a prescribed program designed by the researchers, and 4) an inactive and non-exercising control group.

Methods

Program Design

This study included two stages: 1) a mentor preparation stage, and 2) an intervention stage. In the mentor preparation stage, 36 older adults were recruited and trained as peer mentors. In addition, 16 undergraduate students were recruited and trained as student mentors. In the intervention stage, 106 additional older adults were recruited either as control or assigned to one of the three intervention (mentored) groups. The student mentors and peer mentors implemented a prescribed exercise program provided by the researchers; the independent peer mentors were responsible for developing and implementing their own exercise program. Intervention participants completed a series of functional fitness assessments prior to the intervention and after 14 weeks of training. A non-exercising control group was used for comparison purposes for selected fitness assessments. The project was approved by the appropriate Institutional Review Board for Research Involving Human Subjects. The testing procedures and the exercise program activities were thoroughly explained to all subjects and written consent forms were collected from all peer mentors, as well as from all intervention and control group participants.

Preparation of Peer Mentors and Student Mentors

A group of 36 older adult peer mentors (23 men and 13 women; mean ± SD age: 68.2 ± 5.4 years; age range: 60–76 years) was trained and later utilized for this study. The recruitment of the peer mentors from the local community was assisted by the institution's alumni contact list and a local newspaper advertisement. There were no requirements in terms of level of education, type of professional career, or general knowledge in health and fitness for the peer-mentor applicants; however, a self-reported physically active lifestyle was preferred and a full commitment to regular participation and to working as a peer mentor was required. The recruited group of peer mentors participated in a 30-week peer mentor preparation program. The purpose of the peer mentor preparation program was to: 1) improve the prospective peer mentors' physical health and fitness, and 2) to train them to be peer mentors for the older adult participants in the intervention stage. During the first 14 weeks of the peer mentor preparation, prospective peer mentors participated in an exercise program specifically designed for older adults. This exercise program included three 75-minute supervised exercise sessions per week and focused on muscular and cardiovascular fitness, power, agility, and flexibility, as well as an exposure to a variety of exercise techniques. In the second half of the 30-week peer mentor preparation, the vigorous physical training was supplemented by activities aimed to improve the participants' mentoring skills. Activities included one-on-one mock training sessions with other older adult participants, as well as a 3-week mock training period with college students acting as clients to be trained.

Additionally, all peer mentors completed a 40-hour seminar series presented over eight weeks. During these seminars various topics were discussed, including the general concepts of aging, health and fitness, principles of training, methods of warm-up and stretching, and exercise safety. Table 1 provides additional details on the seminar topics. The contents of these seminars were developed by the researchers and mimicked undergraduate level Kinesiology classes for personal trainer preparation. The seminar series was concluded with

a final quiz. All 36 peer mentor applicants successfully completed the 30-week preparation with adequate participation rate and were asked to participate as peer mentors in the intervention stage of the study. A small group of peer mentors, who demonstrated a superior understanding of the concepts presented in the seminar series and scored well in the final quiz, were offered the role of independent peer mentors. Five of these older adults voluntarily accepted the additional responsibility of designing and implementing the exercise program for the independent peer-mentored group participants. The student mentors were graduating undergraduate Kinesiology students with adequate academic background for personal training, and received 3 weeks hands-on training to work with older adults. For this study, the student mentors were completing field-work hours as part of their final course requirement.

Intervention Stage

Eighty-eight older adults 60 years of age or older enrolled as intervention participants. In addition, eighteen older adults were recruited and asked to serve as non-exercising control participants. Participants were recruited mainly through word-of-mouth, and also through a presentation at a local aging expo. All recruited participants were asked to submit a physician's approval for exercise program participation and a signed consent form. Once a physician's release for exercise participation was received, no other exclusion criteria were used from program enrollment; however, participants were expected to have reliable personal transportation to the exercise facility. Participation in the intervention was free of charge. To avoid inflated participation data, no incentives or financial rewards were provided for the participants. Participants were allowed to withdraw at any time.

The 88 older adult intervention participants were assigned to one of three mentoring groups using quasi-randomization: 1) a student-mentored group (N = 8 men and 16 women; mean ± SD age: 69.5 ± 6.5 years; age range: 60–81 years), 2) a peer-mentored group (N = 17 men and 35 women; mean ± SD age: 68.7 ± 6.3 years; age range: 60–85 years) or 3) an independent peer mentored group (N = 7 men and 5 women; mean ± SD age: 68.3 ± 5.4 years; age range: 62–79 years). During the enrollment process, prospective intervention participants were provided eight exercise session times and were asked to select one that best fit their personal schedule. The intervention participants thus self-organized into eight exercise groups, not knowing the type of mentoring they would receive in the given group. Later the eight, approximately equal size exercise groups were randomly assigned a mentoring type: five groups to be mentored by peer mentors, one group by the independent peer mentors, and two groups by student mentors. While the researchers aimed to keep the mentor to participant ratios between 1:1.5 and 1:2, as 1:1 to 1:2 ratios are typically seen in community exercise program settings, the unequal number of available mentors resulted in unequal group sizes in the mentoring type comparison. Also, the size of the exercise facility had a limitation of maximum 14 participants to be trained at a given time. These factors greatly limited the total number of participants to be assigned to the independent peer-mentored and student-mentored groups. Specifically, the 31 peer mentors were able to take on five groups of intervention participants (total of 52 participants), the small group of five independent peer mentors was able to work with only one group of twelve participants, and two groups of eight student mentors with two groups of twelve participants.

The intervention program was 14 weeks long with two 75-minute training sessions weekly. The program was carried out in a small exercise facility located on the local university campus. The facility was well equipped with cardio and weight training machines, free weights, as well as alternative exercise equipment to include rubber bands, medicine balls, Swiss-balls, kettlebells, balance foams, wobble-discs, and agility hurdles. The exercise programs for the student-mentored and peer-mentored groups were designed by the researchers and were identical in terms of exercise selection, intensity, rest intervals, and

number of sets and repetitions. Independent peer mentors designing the exercise program for their group formulated their own program to meet the same goals and to achieve physical improvements in the same areas as the program designed by the researchers. However, the program designed by the independent peer mentors differed from the researchers' program in the exercise selection, number and type of exercises, number of sets and repetitions used, and/or training intensities and rest intervals applied. Independent peer mentors were also allowed to design their own warm-up and cool-down routines and utilize any equipment located in the exercise facility. The five independent peer mentors were asked to work collectively when designing exercise sessions.

During the exercise sessions, the role of the student mentors, peer mentors, and independent peer mentors were the same. Mentors carried out the daily exercise sessions, guided the intervention participants, assisted with movement execution, and provided motivation for greater effort. In all three mentored groups, intervention participants and mentors paired up self-selectively, and this process was not controlled by the researchers. Participants and mentors were allowed to pair up for any number of sessions or to switch from session to session if desired. In case of absence of a mentor or a participant, new pair-ups were necessary. If mentors were absent, the attending mentors took the unpaired participants, having up to two participants at a time. If participants were absent, the attending participants were evenly distributed among the attending mentors. It was ensured that all intervention participants paired up with a mentor and that mentors were not left without an intervention participant. To ensure program safety and answering questions from mentors, trained and experienced program supervisors attended all sessions, but were instructed to interfere with the mentors' work only when necessary (i.e. unsafe practices or improper equipment use), particularly during the independent peer-mentored sessions. Supervisors' interference was relatively rare, appeared to be at the same frequency between the peer-mentored and student-mentored groups, and mainly occurred during the first few weeks of the program.

Data Collection

A widely used older adult fitness testing battery designed by Rikli and Jones (1999) was applied to assess the physical fitness of all intervention and control participants at baseline and following the 14-week intervention. During the pre- and post-test sessions, following the height and weight measures, functional fitness assessment for the intervention groups included 30-second chair stand and 30-second arm curl tests (muscular endurance), hand grip dynamometry (muscular strength), chair sit-and-reach and back scratch tests (flexibility), 6-min walk test (cardiovascular fitness), 8-ft up-and-go test (motor agility/dynamic balance), and forward reach test (balance). For the control group, due to practicality and time-efficiency considerations, only the muscular strength and agility tests were applied, to include the 30-second chair stand and arm curl tests, the hand grip dynamometry, and the 8-ft up-and-go test. Performance on the handgrip strength test was defined as the greatest score (in kg) achieved on the handgrip dynamometer with the dominant hand. Performance on the 30-second chair stand and 30-second arm curl tests was defined as the maximum number of repetitions achieved in 30 seconds. Flexibility performance assessed by the chair sit-and-reach and back scratch tests and balance performance assessed by the forward reach test were defined as the maximum distance (in inches) achieved. Cardiovascular fitness performance was defined as the maximum distance (in yards) walked in 6-minutes. Agility performance was defined as the least amount of time (in seconds) required to complete the 8-ft up-and-go test. Participation was defined as attendance at a given program session and participation rate was determined by dividing the number of sessions attended by the total number of sessions offered.

Statistical Analysis

All statistical analyses were performed using the SAS version 9.1.3 (SAS Institute Inc., Cary, NC) software package. Physical fitness pre- versus post-test results were compared by using a General Linear Mixed Model Analysis for repeated measures with Tukey's post-hoc procedure for the mean comparisons. Program participation data for the intervention group participants, and for the student-, peer- and independent peer-mentors were compared by the General Linear Model Analysis for independent samples with the Least Significant Difference post-hoc procedure for mean comparisons. Retention rates were compared using the Chi-Square Test. Criterion alpha level for significance was set at $p \leq 0.05$ for all analyses.

Results

Baseline descriptive characteristics of the older adult peer mentors (N=36) and all intervention (N=88) and control group (N=18) participants are presented in Table 2. At baseline, there were no statistically significant differences between the three experimental groups for age, weight, or BMI measures ($p>0.05$). For age, height, and BMI, all three experimental groups were significantly different from the Control group ($p<0.05$), and for height, the independent peer-mentored group was different from the peer-mentored and student-mentored groups ($p<0.05$). No significant differences were observed among the experimental and control groups for weight ($p=0.6316$).

No drop-outs occurred during the 14-week intervention among the mentors, as all peer, independent peer, and student mentors were retained in the program. During the 14-week intervention stage, all student mentors attended all exercise sessions, therefore demonstrating 100% participation. Volunteer peer mentors attended an average 75.6% of the training sessions where they mentored older adults (20.4 of the total 27 sessions), while independent peer mentors attended 92.6% of the sessions (25.0 of 27 sessions) (Table 3). Statistical analysis indicated that both independent peer mentors and student mentors attended a significantly greater percentage of sessions than peer mentors ($p<0.0001$).

For the intervention stage, 80 of the 88 intervention participants completed the 14-week program. Specifically, 20 student-mentored participants (7 men and 13 women), 49 peer-mentored participants (16 men and 33 women), and 11 independent peer-mentored participants (6 men and 5 women) completed the post-training assessment at 14 weeks. This translates to similar retention rates ($p=0.306$), 83.3% in the student-mentored group, 94.2% in the peer-mentored group, and 91.7% in the independent peer-mentored group. Participation rates were also similar ($p=0.8126$) between the student-mentored, peer-mentored, and independent peer-mentored groups. The average participation rate for those completing the 14-week intervention was 81.9% for the student-mentored, 83.6% for the peer-mentored, and 81.5% for the independent peer-mentored group participants (Table 3).

For seven of the eight functional fitness tests, no significant differences were observed between the three experimental groups at pre-test ($p>0.11$). For the 30-second chair stand pre-test, the peer-mentored group had significantly higher repetition values than the other two intervention groups and the control group ($p<0.0169$). For the handgrip strength ($p<0.0001$) and 8-ft up-and-go agility tests ($p<0.0001$) all three experimental groups, while for the 30-second arm curl test the student-mentored ($p=0.0013$) and peer-mentored ($p=0.0005$) groups showed significantly better values at pre-test, when compared to the control group (Table 4). Compared to baseline values, with the exception of the hand grip strength ($p=0.0632$) and the back scratch flexibility ($p=0.0588$) tests in the student-mentored group, post-test data indicated that participants made significant improvements in all fitness measures in the student-mentored ($p<0.0001$), peer-mentored ($p<0.0031$) and independent

peer-mentored ($p<0.0013$) groups. The non-exercising control group showed minimal, non-significant improvements in the 30-second chair stand ($p=0.3878$), handgrip strength ($p=0.9611$) and 8-ft up-and-go ($p=0.7311$) tests, and a modest but significant improvement in the 30-second arm curl ($p=0.0126$) test.

While there were significant improvements in fitness measures from baseline to post-test, the improvements were similar among the experimental groups for the chair sit-and-reach, back scratch, 6-minute walk and forward reach tests ($p>0.19$). Due to data collection limitations, no control group data were collected on these variables, thus no statistical comparisons were conducted. For the 30-second chair stand, 30-second arm curl, and 8-ft up-and-go tests, significant group-by-time interactions were observed ($p<0.0138$), indicating that while improvement patterns were similar between the student-mentored, peer-mentored and independent peer-mentored groups, these groups demonstrated greater improvements compared to the control group. For the handgrip strength test, the group-by-time interaction was non-significant ($p=0.0978$), indicating similar improvement patterns between the four groups. No adverse events or major injuries occurred during the 14-week intervention.

Discussion

Lack of exercise guidance and social support that generally prevent older adults from regular physical activity may be overcome by preparing and utilizing peer mentors in exercise programs. The peer mentoring model has been used successfully in various clinical interventions with a variety of populations, including patients with arthritis (Lorig et al., 2001), cardiac patients (Parent & Fortin, 2000), breast cancer patients (Ashbury, Cameron, Mercer, Fitch, & Nielsen, 1998), HIV patients (Broadhead et al., 2002), burn patients (Williams et al., 2002), and diabetic patients (Joseph, Griffin, Hall, & Sullivan, 2001). Also, some health promotion programs have attempted to utilize peer mentors to guide novice participants through physical activity programs, but research investigating the effectiveness of this model among older adult exercise program participants has been sparse.

One study that aimed to investigate the effectiveness of peer mentoring or peer leadership in a physical activity program for older adults failed to provide adequate preparation for peer mentors and implemented the peer mentoring model without any structure (Grove & Spier, 1999). In that study, peer mentors were laypersons who volunteered to guide others without any exercise prescription or mentoring experience. Not surprisingly, the authors reported low program participation rates and concluded that utilizing the peer mentoring concept was ineffective (Grove & Spier, 1999). Indeed, conceptually, laypersons may be capable of providing counseling to others only if they receive an adequate amount and quality of preparation prior to the intervention (Kirkpatrick & Patchner, 1987). This concept might have been overlooked in the study of Grove and Spier (1999), but several recent studies found effectiveness in peer mentoring once peer mentors were well trained. Recent research by Layne and colleagues (2008), Buman and colleagues (2011), Castro and colleagues (2011), as well as studies from our laboratory (XXX, 2009; XXX, 2011) provided adequate preparation for prospective peer mentors and concluded that the concept of peer mentoring was a viable method to engage previously inactive older adults in regular physical activity programs.

However, our previous report concluded that the implementation of a peer mentor model in a 14-week intervention was not without limitations and incurred difficulties (XXX, 2009). Our report indicated that some peer mentors had difficulty remembering the names and proper technique of certain exercises, had difficulties guiding their assigned older adult participants, occasionally used spotting techniques incorrectly, failed to provide specific or correct feedback to participants, and frequently sought guidance from the program

supervisors (XXX, 2009). With some peer mentors we observed that they were uncertain in their decisions and struggled to independently manage all supervisory tasks. Based on our reported observations we hypothesized that a combination of educational lectures addressing the principles of fitness and training, and abundant practice opportunities for mentors may potentiate the effectiveness of a peer mentor preparation program (XXX, 2009). Therefore, in the present study we applied an enhanced peer mentor preparation program that included a 40-hour educational seminar series and considerable practical experience. The findings of our current study demonstrate that older adult peer mentors are capable of being fully responsible for the design and implementation of an exercise program that elicits significant improvements in physical fitness with high retention and participation of older adults.

The retention and participation rates of the mentors (student mentors, peer mentors and independent peer mentors) were excellent. All mentors were retained throughout the 14-week intervention. Peer mentors attended an average 75.6% of the exercise sessions when they were to guide novice older adult participants. Three of the peer mentors had serious health problems unrelated to the program that resulted in low participation (i.e. < 50%). With these three individuals removed, the average participation of the peer mentors increased to 80.0%. Independent peer mentors, however, demonstrated an even higher participation pattern that was statistically different than that of the peer mentors. All of the independent peer mentors participated in more than 80% of the exercise sessions, two of them attended all sessions. It may be possible to infer that the independent peer mentors were more motivated or excited about their mentoring sessions than the other peer mentors. Also, the increased level of responsibility might have encouraged the independent peer mentors to attend more sessions and to be more attentive to their older adult participants. In fact, we learned that independent peer mentors met frequently outside the scheduled training sessions to discuss the training program design and collectively determined their strategies for guiding participants.

Nevertheless, all mentored groups demonstrated outstanding retention and participation rates of the older adult intervention participants. Retention rates in the peer-mentored and independent peer-mentored groups were slightly higher than in the student-mentored group (94.2%, 91.7% and 83.3%, respectively), but these differences did not reach statistical significance. These retention rates compare very favorably to the 66% to 90% retention rates reported for previous older adult exercise interventions of similar duration (Boyette et al., 2002; Emery & Gatz, 1990; Gillies, Aitchison, MacDonald, & Grant,1999; Rubenstein et al., 2000), and is excellent compared to a low 53% retention reported by Caserta and Gillett (1998). Participation rates of the intervention participants in the three mentored groups were high and almost identical (83.6%, 81.5% and 81.9%). These participation rates also compare favorably to rates reported in other exercise interventions for older adults (61%–87%) (van der Bij et al., 2002). Our interpretation of these results is that all three mentor groups were effective in retaining older adults and participants responded well to the efforts of the mentors encouraging frequent program participation. It appears that the type of mentoring did not have a significant effect on the participants' program participation.

Our findings further indicate that the 14-week exercise program was effective in improving the fitness assessment scores of the participants in all three groups. Compared to pre-training values, only two fitness measures in the student-mentored group showed non-significant changes ($p>0.057$), although some improvements were observed. All other fitness measures in the student-mentored group, as well as all measures in the peer-mentored and independent peer-mentored groups showed significant ($p<0.0027$) improvements for the intervention participants (Table 4). On the contrary, control group participants showed non-significant ($p>0.3877$) improvements in three of the four assessed fitness measures, and although demonstrated a modest and significant improvement on the upper body strength measure

(p=0.0126), this was likely due to exercise familiarization and improved comfort of execution. Analysis of group differences between the intervention groups showed non-significant differences, in fact in many cases the absolute and relative changes in fitness measures were similar between the three mentored groups, while these improvements were significantly better ($p<0.0138$) than the minimal improvements seen in the control group (Table 4).

These findings suggest that compared to the non-exercising control group, older adults in the intervention groups showed improvement in fitness regardless of the type of mentoring received. Student mentors, who arguably were better trained and more prepared than the peer mentors, aimed to provide “professional mentoring” to older adult participants. Although the student mentors were not professionals with extensive experience, all of them were in their last semester of undergraduate studies and many of them already obtained their professional fitness certifications. Comparably, peer mentors received less extensive training and had even less experience with guiding others in a fitness setting. On the contrary, peer mentors may have had general, non-fitness related mentoring and supervisory experiences from their professional careers. Nonetheless, the positive changes observed with the various fitness assessment scores indicate that the peer mentors adequately guided the intervention participants and considerable fitness improvements were elicited. However, it is likely that older adult peer mentors must receive fairly extensive training and education to become somewhat experienced in order to successfully mentor participants. The extent of the exact preparation necessary for successful peer mentoring remains a subject for future research.

This study was not without some limitations. The inclusion of student mentors may be seen as a limitation, as ideally peer mentors should be compared to experienced professionals (i.e. certified personal trainers) working in the typical fee-based fitness setting. While arguably professionals may pay even closer attention to their participants, particularly in a fee-based client setting where retaining participants is essential for business, we argue that our student mentors were adequately prepared for the mentoring task and possessed knowledge and practical experience closely comparable to the professionals. As such, we perceive that the present study design using student mentors was appropriate to assess the effectiveness of the peer mentor and independent peer mentor model. A second limitation, however, is related to our study design using a non-exercising control group. While the older adult control group participants provided a basis for comparison in the selected fitness measures, it was no surprise that we observed minimal if any changes in fitness compared to the intervention group participants improving significantly. In a more ideal study model, a second control group might be recruited, representing older adult participants who attend an exercise program but receive no mentoring at all. Although it is ethically questionable whether researchers should ask older adults novice to fitness to start exercising alone without any supervision or guidance, this model would truly highlight if mentoring has any effects on the retention and participation rates, or the fitness assessments. It is our speculation that such control group would demonstrate very poor retention and participation rates.

A major limitation to the present study was the unequal group sizes, particularly the small size of the independent peer-mentored group. Indeed, future studies replicating a similar study model should aim to have possibly equal number of mentors and participants among the different mentoring groups. Our study was affected by the unequal numbers of available mentors, particularly that out of our 36 peer mentors we approached only the best performing ones, and only five of them agreed to the added work and responsibility of taking on the independent peer mentor role. Although all peer mentors provided substantial help to their participants on a regular basis, the independent peer mentors likely had twice as much volunteer work invested into training their participants. Some older adults were simply reluctant to agree to this increased amount of volunteer work and level of responsibility.

Another limitation to the study is our choice of fitness assessments. While we aimed to select assessment techniques widely accepted in older adult exercise research, we acknowledge that these functional fitness assessments are not high reliability laboratory tests, and may only be surrogates for clinical measures.

Nevertheless, a major finding of the present study was that a group of volunteering peer mentors was able to independently implement an exercise program for older adults without receiving any assistance in the program design and implementation process. During this intervention, we did not observe difficulties reported in our previous study (XXX, 2009). It appears that our improved peer mentor preparation program was effective and provided prospective peer mentors both the minimum knowledge and the practical experience necessary to effectively guide novice older adults in physical activity settings. Although the 30-week peer mentor preparation program, including a structured 40-hour seminar series and 15 weeks of mentoring skill practice through one-on-one mock training sessions may seem burdensome and appear as a large investment of time and effort, this level of preparation appears necessary to effectively train novice older adults to supervise exercise sessions. As such, we believe that our intervention can be generalized and replicated in other settings, including community-based program settings. We highlight, however, the peer-mentor preparation may need to differ from setting to setting. Also, dependent on the supervisory background and physical fitness experience of the peer mentor applicants, the mentor preparation may need to be more or less extensive. With the properly designed and thorough preparation, volunteer older adult peer mentors may replace professional staff working on a fee-basis, and achieve similar results with older adult program participants. Consequently, the peer mentoring model has the potential to engage older adults in long-term exercise programs in a cost-effective fashion.

Acknowledgments

We would like to thank the volunteer work of all student, peer and independent peer mentors. We would like to recognize the assistance from Gregory Brickey, Timothy Groover, and Carlos Saucedo in the data collection. Also, we would like to acknowledge Chandra S. Bulusu for assisting with the data collection for the control group data.

Funding

This work was supported by the Ageless Health Initiative of the Paso del Norte Health Foundation; by the National Center on Minority Health and Health Disparities at the National Institutes of Health through the Hispanic Health Disparities Research Center (Grant Number P20MD002287); and by the National Institute on Minority Health and Health Disparities (NIMHD) (Grant Number 8G12MD007592). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health, the National Center on Minority Health and Health Disparities, the Research Centers in Minority Institutions, or the Hispanic Health Disparities Research Center.

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What is already known about the topic?

- Older adults should engage in regular physical activity to maintain functional fitness
- Lack of mentoring or supervision from fitness professionals or experienced peers often prevent older adults from participating in regular exercise
- Peer mentoring has been shown as an effective model to recruit and retain older adults in physical activity programs, and to achieve improvements in fitness

What this paper adds?

- Demonstrates that high participant retention may be achieved with mentoring provided both by young fitness professionals and peer older adults
- Highlights that peer mentors can effectively mentor older adults in an exercise program setting, achieving fitness improvements
- Shows that well prepared older adult peer mentors may be able to take full responsibility for an exercise program design and implementation

Table 1

Structure of the 40-hour peer-mentor preparation lecture series.

Section	Topic	Number of Sessions	Content
Foundations of Fitness Total: 10 sessions (20 hours)	Human anatomy	2	Basic anatomical terminology; skeletal system; muscular anatomy; major skeletal muscles and functions;
	Biomechanics	1	Levers; planes of motion; joint movements; types of muscle contractions; role of muscles; actions of major muscles
	Nutrition	2	Macronutrients (protein, carbohydrate, fat); other nutrients; pre- post-exercise nutrition; dietary supplements; food guide pyramid; principles of weight gain/loss; eating disorders and obesity
	Bioenergetics	1	Basic terminology; metabolism; energy systems; principles of energy use; substrate depletion and repletion; oxygen uptake
	Structure and physiology of the muscular, cardiovascular and respiratory systems	2	The heart; measurement of heart rate; blood vessels and circulation; gas transport/exchange; the lungs; exchange of air and respiratory gases; basic physiological terms and principles;
	Aging related changes in muscular, cardiovascular endurance and flexibility fitness	2	Changes in musculoskeletal and cardiovascular health; adaptations to resistance/ cardiovascular/flexibility training; detraining and overtraining in resistance training;
	Components of fitness and athletic performance; assessments of fitness	1	Definition of fitness components; assessment of fitness components; safety factors, administration and organization of assessment; interpretation of assessment data;
	Principles of warm-up, cool- down and flexibility training	2	Purpose of warm-up and cool-down; physiological outcomes of warm-up and cool-down; warm-up and cool-down procedures; factors affecting flexibility; principles of flexibility training
Program Design Total: 10 sessions (20 hours)	Resistance training program design	3	Basic terminology; training modalities; principles of resistance training; program design considerations (needs analysis, choice of exercise, training frequency, exercise order, training load, exercise volume and repetitions, rest periods, training system variations)
	Cardiovascular endurance training program design	2	General guidelines; safety considerations; factors of aerobic endurance; program design (mode, frequency, duration, intensity); monitoring intensity; types of training programs;
	Power, speed, agility, and balance training and program design	2	Neural and muscular physiology of power/speed/agility/balance training; principles of training design; training modalities; safety considerations; proper technique

Int J Nurs Stud. Author manuscript; available in PMC 2014 September 01.

Table 2

Mean (±SD) pre-test age, height, weight, BMI and post-test BMI characteristics of the Peer-Mentors and Independent Peer-Mentors, and the Student-Mentored, Peer-Mentored, Independent Peer-Mentored, and Control group participants.

GROUP	N	Pre-test Age (years)	Pre-test Height (cm)	Pre-test Body Mass (kg)	Pre-test BMI (kg/m^2)	Post-test BMI (kg/m^2)
Peer Mentors						
Males	20	71.0 ± 5.2	174.1 ± 6.3	84.8 ± 10.3	28.0 ± 3.6	No data
Females	11	65.1 ± 3.6	161.0 ± 7.2	69.0 ± 11.2	26.8 ± 5.0	
Independent Peer Mentors						
Males	3	64.0 ± 3.4	167.9 ± 7.4	90.2 ± 10.5	28.1 ± 3.2	No data
Females	2	64.1 ± 2.0	161.0 ± 2.8	64.4 ± 1.7	24.8 ± 0.2	
Student-Mentored group						
Males	8	70.9 ± 6.8 *	177.0 ± 7.1 *†	95.0 ± 28.8	30.1 ± 8.1 *	30.0 ± 8.3 *
Females	16	69.6 ± 6.3 *	161.3 ± 8.4 *†	74.5 ± 15.7	28.9 ± 7.4 *	28.5 ± 7.1 *
Peer-Mentored group						
Males	17	68.3 ± 6.9 *	173.9 ± 4.7 *†	93.1 ± 18.6	30.7 ± 5.6 *	30.4 ± 5.5 *
Females	35	68.1 ± 5.7 *	161.0 ± 6.4 *†	69.5 ± 11.3	26.9 ± 4.7 *	26.7 ± 4.4 *
Independent Peer-Mentored group						
Males	7	69.2 ± 4.4 *	174.9 ± 2.4 *	90.7 ± 10.0	29.6 ± 3.0 *	29.2 ± 2.9 *
Females	5	65.2 ± 3.6 *	168.2 ± 7.1 *	69.6 ± 8.6	24.6 ± 2.3 *	24.5 ± 2.3 *
Control group						
Males	2	79.5 ± 13.4	172.4 ± 9.5	99.9 ± 44.1	32.9 ± 11.2	32.4 ± 10.2
Females	16	77.9 ± 9.2	154.3 ± 5.4	79.6 ± 14.8	33.5 ± 6.8	33.5 ± 7.2

* Males and females combined significantly different than Control group males and females combined ($p<0.05$).

† Males and females combined significantly different than Independent Peer-Mentored group males and females combined ($p<0.05$).

Table 3

Participant retention and mean (±SD) participation rates for the Student-Mentored, Peer-Mentored, Independent Peer-Mentored, and Control groups.

Group	Number participating at baseline	Number retained at 14 weeks	Retention rate	Average number of training sessions attended (out of 27)	Percent participation[a]
Peer Mentors	31	31	100%	20.4 ± 5.0	75.6 ± 18.5
Independent Peer Mentors	5	5	100%	25.0 ± 2.1	92.6 ± 7.9 *
Student Mentors	16	16	100%	13.0 ± 0.0 [b]	100.0 ± 0.0 *
Student-Mentored Participants	24	20	83.3 %	22.1 ± 4.2	81.9 ± 15.7
Peer-Mentored Participants	52	49	94.2 %	22.6 ± 3.0	83.6 ± 11.0
Independent Peer-Mentored Participants	12	11	91.7 %	22.0 ± 3.9	81.5 ± 14.3
Control Participants	18	18	100%	n/a	n/a

[a] Percent participation calculated for subjects completing the 14-week program.

[b] Student Mentors were required to attend 14 training sessions total as a mandatory course assignment.

* Significantly higher than Peer Mentors ($p<0.0001$).

Table 4

Mean (±SD) functional fitness scores for the Student-Mentored, Peer-Mentored, Independent Peer-Mentored, and Control groups.

Variable	Group	Baseline	Post-Training	Absolute Change	Percent Change	Pre-post P-value
30-s Chair Stand (repetitions)[a]	Student-Mentored	13.1 ± 3.2	19.1 ± 6.6*	6.0	45.6	<0.0001
	Peer-Mentored	16.3 ± 5.2*†‡	22.1 ± 6.1*†‡	5.8	35.6	<0.0001
	Independent Peer-Mentored	12.4 ± 3.7	18.8 ± 4.1*	6.4	51.6	<0.0001
	Control	10.1 ± 3.5	10.9 ± 3.4	0.8	8.1	0.3878
30-s Arm Curl (repetitions)[b]	Student-Mentored	19.8 ± 4.7*	27.7 ± 4.1*	7.9	40.0	<0.0001
	Peer-Mentored	19.6 ± 4.8*	30.5 ± 5.3*	10.9	55.9	<0.0001
	Independent Peer-Mentored	18.3 ± 6.1	28.7 ± 6.0*	10.5	57.4	<0.0001
	Control	14.7 ± 5.6	16.6 ± 3.4	1.9	12.8	0.0126
Handgrip Dynamometer (kg)[b]	Student-Mentored	29.6 ± 9.5*	30.9 ± 9.5*	1.3	4.4	0.0632
	Peer-Mentored	30.5 ± 9.2*	31.7 ± 9.3*	1.2	3.8	0.0031
	Independent Peer-Mentored	32.6 ± 9.4*	33.8 ± 8.6*	1.1	3.5	0.0016
	Control	18.4 ± 7.7	18.5 ± 6.1	0.03	0.2	0.9611
Chair Sit-and-Reach (in)[c]	Student-Mentored	1.4 ± 5.3	3.6 ± 5.1	2.1	_[h]	<0.0001
	Peer-Mentored	−0.3 ± 3.8	2.0 ± 4.5	2.3	_ [h]	<0.0001
	Independent Peer-Mentored	−1.4 ± 4.2	0.5 ± 5.4	1.9	_ [h]	0.0001
	Control	No data				
Back Scratch (in)[d]	Student-Mentored	−3.7 ± 5.5	−3.2 ± 5.9	0.5	_[h]	0.0588
	Peer-Mentored	−2.0 ± 3.5	−0.9 ± 3.3	1.1	_ [h]	<0.0001
	Independent Peer-Mentored	−3.6 ± 4.9	−2.0 ± 4.1	1.6	_ [h]	0.0004
	Control	No data				
6-Minute Walk (yards)[e]	Student-Mentored	594.1 ± 141.4	667.6 ± 101.1	73.4	12.4	<0.0001
	Peer-Mentored	628.1 ± 97.4	695.6 ± 81.3	67.5	10.7	<0.0001
	Independent Peer-Mentored	644.0 ± 86.2	753.8 ± 61.1	109.0	16.9	<0.0001
	Control	No data				
8-ft Up-and-Go (s)[f]	Student-Mentored	5.6 ± 0.9*	4.8 ± 0.9*	−0.9	15.5	<0.0001
	Peer-Mentored	5.0 ± 0.9*	4.3 ± 0.8*	−0.7	14.8	<0.0001

Variable	Group	Baseline	Post-Training	Absolute Change	Percent Change	Pre-post P-value
Forward Reach Test (in)[g]	Independent Peer-Mentored	5.3 ± 2.0 *	4.1 ± 0.7 *	−1.1	21.5	0.0006
	Control	12.1 ± 3.6	11.8 ± 3.0	−0.3	2.5	0.7311
	Student-Mentored	15.9 ± 2.5	18.1 ± 3.7	2.2	13.9	<0.0001
	Peer-Mentored	16.2 ± 2.8	18.1 ± 3.1	1.9	11.5	<0.0001
	Independent Peer-Mentored	14.8 ± 2.3	17.8 ± 1.9	3.0	20.3	<0.0001
	Control	No data				

[a] Lower body strength test: 30-second chair stand.

[b] Upper body strength: arm curl and handgrip dynamometer.

[c] Lower body flexibility: chair sit-and-reach.

[d] Upper body flexibility: back scratch.

[e] Aerobic endurance: 6-minute walk.

[f] Motor agility: 8-ft up-and-go.

[g] Balance: forward reach test.

[h] Due to potential negative values for the flexibility tests, calculations of percent change are not applicable

[*] Significantly different than Control group ($p<0.05$).

[†] Significantly different than Independent Peer-Mentored group ($p<0.05$).

[‡] Significantly different than Student-Mentored group ($p<0.05$).