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Authors

Sarkisian, Catherine A.
Weiner, Bernard
Davis, Connie
et al.

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Pilot Test of an Attribution Retraining Intervention to Raise Walking Levels Among Sedentary Older Adults

Running Title: Attribution Retraining Walking Intervention

Catherine A. Sarkisian, MD, MSPH[*]

Thomas R. Prohaska, PhD[†]

Connie Davis, MN, ARNP[‡]

Bernard Weiner, PhD[§]

[*]Division of Geriatrics, Department of Medicine, David Geffen School of Medicine at UCLA, Los Angeles, CA

[†]Community Health Sciences, School of Public Health at UIC, Chicago, IL

[‡]Fraser Health Authority, Abbotsford, BC, Canada

[§]UCLA Department of Psychology, Los Angeles, CA

Corresponding Author:

Catherine A. Sarkisian, MD, MSPH

UCLA Department of Medicine, Division of Geriatrics

10945 Le Conte Avenue, Suite 2339

Los Angeles, CA. 90095-168

Tel: 310-825-8253

Fax: 310-794-2199

Email: csarkisian@mednet.ucla.edu

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ABSTRACT:

Objective: to pilot test a new behavioral intervention to increase walking among sedentary older adults

Design: Pre-post community-based pilot study

Setting: 3 senior centers in greater Los Angeles

Participants: 46 sedentary adults aged ≥ 65 years

Intervention: At 4 weekly 1-hour group sessions held at the senior centers, a trained health educator applied a theoretically-grounded standardized "attribution retraining" curriculum developed by this multidisciplinary team. Participants were taught that becoming sedentary is not inevitable with aging, and that older adults should attribute being sedentary to modifiable attributes, rather than to "old age." Each weekly attribution retraining session was followed by a 1-hour exercise class including strength, endurance, and flexibility training.

Measurements: Change from baseline in steps/week recorded by digital pedometer was measured after 7 weeks. Age-expectations and health-related quality of life were measured with in-person interviews.

Results: Mean steps/week increased from 24,749 to 30,707, a 24% increase ~equivalent to 2.5 miles (2-sided t-test p=0.002). Age-expectations increased 30% (p=.0003) and the changes in age-expectations and steps/week correlated (r=.39, p=.01). Participants experienced improved mental health-related quality of life (p=.049) and reported decreased difficulty with activities of daily living (p=.041). Over 50% of participants reported improvements in pain, energy level, and sleep quality.

Conclusion: In this small pre-post community-based pilot study, a structured attribution retraining curriculum accompanied by a weekly exercise class was associated with increased

walking levels and improved quality of life among sedentary older adults. Attribution retraining deserves further investigation as a potential means of increasing physical activity among sedentary older adults.

KEY WORDS: exercise, intervention studies, attitude toward aging, aged, community medicine

INTRODUCTION:

Eliminating sedentary lifestyle among middle age and older adults offers one of the greatest opportunities to reduce morbidity and mortality in the United States. [1] Unfortunately, most interventions aimed at inducing older adults to initiate and maintain recommended levels of physical activity succeed for only a modest percentage of participants.[2, 3] Decreasing sedentary lifestyle among older Americans remains one of our greatest public health challenges.

To induce regular physical activity, several theoretical models have been applied, with varying degrees of success across different populations and behaviors. Diverse in their approaches and scope, these theoretical models have provided the foundation for a range of physical activity interventions, yet there remains no consensus regarding which combination of theories is the best at promoting physical activity among older adults.[4-6] Additional, age-appropriate theoretical models that serve as the basis for interventions to increase and sustain physical activity among older adults are required.

With this imperative in mind, this multidisciplinary team presents a new theoretically-grounded behavioral intervention developed specifically to address the common phenomenon among older adults of attributing inactivity to "old age." Based on observational data showing that older adults who have low age-expectations and attribute age-associated conditions to old age are more likely to be sedentary,[7] this team hypothesized that it might be possible to raise physical activity levels among sedentary older adults by intervening to raise age-expectations through attribution retraining, e.g. teaching older adults not to attribute being sedentary to "old age," but rather to expect to be physically active at all ages. The specific aim of this brief report is to present results

from a pilot test of a community-based intervention applying attribution retraining in combination with an exercise class in order to increase walking among sedentary older adults.

METHODS:

Theoretical Model: Attribution Theory

Weiner's attribution theory of achievement motivation is based upon the premise that individuals explain successes and failures using causal attributions that can be classified into 3 dimensions: 1) locus of causality (internal or external); 2) stability (stable or unstable); 3) controllability (controllable or uncontrollable).[8] According to this theory, attributions that are stable and uncontrollable are especially detrimental to motivation. For example, a student who attributes poor test performance to stable and uncontrollable lack of aptitude would be unlikely to change behavior, but one who attributes poor performance to not studying hard enough (unstable and controllable) would be more likely to successfully change his or her behavior. Attribution retraining techniques, therefore, are designed to encourage people to reject stable and uncontrollable attributions and instead adopt *unstable* and *controllable* explanations for failure.[9] Attribution retraining interventions have been applied in the field of education with encouraging results: several short-term interventions utilizing attribution retraining have increased motivation and academic performance.[10]

Given the large body of empiric work illustrating that attributing health problems to "old age" is a common phenomenon among older adults,[11, 12] attribution theory emerged as a naturally appropriate theoretical framework for a behavioral intervention among older adults. Several empirical studies have demonstrated an association between having low perceptions of aging and poor health outcomes.[13-15] Furthermore, having low age-expectations is strongly associated with low physical activity levels among older adults;[16] suggesting that intervening to raise older adults' age-expectations and discourage them from attributing being sedentary to "old age" (a

stable and uncontrollable attribute) could signify an important opportunity to increase physical activity among older adults. For this behavioral intervention, the team designed an intervention (described in greater detail below) utilizing attribution retraining in a group-mediated cognitive-behavioral (GMCB) format. This format was selected because of substantial evidence supporting its efficacy as a framework for behavioral change (alone or in combination with other theoretical models).[2, 17-20]

Study Design: The pilot test was a non-blinded pre-post investigation. Outcome data was measured 7 weeks after the start of the 4-week intervention. The purpose of the pilot test was: 1) to determine whether this intervention could succeed in raising walking levels among older adults; 2) to assess the feasibility of conducting a trial of the intervention; and 3) obtain preliminary data and estimate the effect size in order to be able to estimate recruitment and sample size requirements for a randomized trial of the intervention. The research protocol was approved by the UCLA Office for the Protection of Human Subjects (IRB #02-11078).

Participant Recruitment and Enrollment: Participants were recruited from three senior centers in the greater Los Angeles region. In collaboration with community partners, bilingual project staff screened interested participants using a standardized screening protocol. To be eligible for the study, potential participants had to be 65 years or greater. Exclusion criteria included: 1) already engaging in 20 minutes or more of moderate intensity (or greater) physical activity at least 3 days a week; 2) inability to communicate verbally in English or Spanish (either due to lack of language skills, hearing impairment, or other disability); 3) inability to sit and participate in a 1-hour discussion session; 4) inability to walk (the use of assistive devices was not an exclusion

criterion); 5) unavailable to attend an orientation session and 4 subsequent weekly sessions; 6) unable/unwilling to provide both the name of a physician who has seen the potential participant in the past 6 months and consent for project staff to contact this physician.

For each potentially eligible participant, a letter from the study team was faxed to his or her physician describing the intervention. Participants whose physician faxed a reply card indicating that the potential subject had a medical contraindication were not eligible. Eligible participants were invited to attend an orientation session at the senior center, at which point staff gave each participant a pedometer with instructions on its use, and collected baseline data. Data collection occurred between May and July, 2003.

Intervention: The attribution retraining involved 4 weekly 1-hour group sessions of 8-14 participants and were conducted in the senior centers. Each session consisted of a facilitated discussion led by a trained health educator. Using a standardized curriculum developed by this multidisciplinary team, facilitators taught participants that becoming sedentary is not an inevitable part of aging, and that failure to be physically active should be, to the greatest extent possible, attributed to controllable causes rather than to "old age." Facilitators encouraged participants to set individualized verbal and written "promises" for increasing their physical activity by increasing the number of steps they take each day, and helped the group problem-solve together to find solutions to the problems limiting participants' ability to fulfill their promises. Facilitators provided verbal reinforcement that being sedentary should not be attributed to "old age," and that all participants should expect to be physically active when aging. Each discussion session was followed by a 1-hour physical activity class taught by a certified

instructor. The fitness class was modeled after the Lifetime Fitness Program© (now called Enhance Fitness ©) administered by Senior Services of Seattle/King County, which includes strength, endurance, and flexibility training, and is designed to be safe for seniors with a wide range of physical abilities.

Measurements: The Digiwalker© (Yamax DW-500, New Lifestyles, Inc., Kansas City, MO) pedometer is a small electronic monitor that measures vertical accelerations, and when worn over the hip at waist level, calculates the number of steps taken with an accuracy within 3% of direct observation, substantially better than self-report.[21, 22] Participants were instructed to wear their pedometer (Digiwalker©) at all times other than sleeping, bathing, or swimming. To minimize the effect of the pedometer itself as a motivational tool, the pedometer cover was taped shut so that participants could not see the recorded number of steps. One week after the orientation session, when participants came to their intervention session (and at each subsequent weekly session), research staff removed the tape from the pedometer cover, copied the number of steps recorded over the previous week, and reset the pedometer to zero. Participants were not shown their step-recordings until the study had been completed.

At baseline, 4-weeks, and seven weeks after the start of the intervention, in-person interviews were conducted by trained bilingual staff. Age-expectations were measured using the Expectations Regarding Aging (ERA)-38 survey, a previously-tested instrument in which higher scores indicate expecting high functioning with aging, and lower scores indicate expecting physical and mental decline.[23] Health-related quality of life (HRQoL) was measured using the Medical Outcomes Study SF-12, and by asking participants how many of 13 activities of daily living (ADLs) they could do without difficulty. Responses to the SF-12 were used to compute a

Physical (PCS-12) and a Mental (MCS-12) Component Summary score using standardized weights based upon a mean of 50 and a standard deviation of 10 in the general U.S. population, with higher scores indicating better health status.[24] Participants were also asked whether they felt the intervention had contributed to changes in pain, mood, or sleep.

Analysis: The primary outcome was change from baseline in steps/week recorded by the digital pedometer 7 weeks after initiation of the 4-week intervention. Change in scores from baseline to 7-week follow-up were examined using 2-sided t-tests.

RESULTS:

Of the 94 screened participants, 57 (61%) met inclusion criteria for the pilot study. Of these, 51 (89% of those screened) came to a subsequent enrollment session and provided written informed consent to participate. Forty-six seniors (90% of enrollees) completed the study. Mean age of the pilot participants was 77 years; 89% were female; 65 % self-identified as Latino, and 33% as non-Latino white. Among completers, overall class attendance exceeded 98%. Of the 5 participants who dropped out, 4 blamed health problems unrelated to the intervention (e.g., pneumonia requiring hospitalization) and one left town for personal reasons.

Table 1 shows the mean steps/week at baseline and 7-weeks after the first session. Based on a conservatively low estimate of gait length taken from a sample of older adults recruited from hospitals,[25] the observed mean increase in steps at 7 weeks (5959) can be estimated to represent approximately 2.5 miles per week.

Because it was hypothesized that the attribution retraining intervention would increase walking levels through a causal pathway of increasing age-expectations, whether the intervention influenced age-expectations, and whether improvements in age-expectations correlated positively with improvements in walking levels was also examined in an exploratory fashion. As shown in Table 1, the intervention raised ERA-38 scores by 30% (0.8 standard deviations). The unadjusted correlation between change in ERA-38 scores and change in steps/week was r=0.36 (95% CI =0.08-0.59, p=.01).

Table 1 also shows the measures of quality of life at baseline and 7 weeks after the start of the 4-week intervention. As illustrated, the mental composite score of the SF-12 increased by

approximately one-third of a standard deviation from 52.1 to 55.3 (p=0.049), and there was a statistically significant decrease in the number of ADL impairments reported.

At 7-weeks after the first session, 100% of the 46 completers reported that the program had been enjoyable. As shown in Figure 1, 100% reported that because of the program their mood improved; 61% reported that the amount of chronic pain experienced on an average day decreased; 85% reported that the program contributed to improving their energy level; 54% reported that the program contributed to improvement in sleep quality. None of the participants experienced adverse events related to the intervention.

DISCUSSION:

In this pre-post pilot study of 46 older adults recruited at community-based senior centers, a 4-week multifaceted attribution retraining intervention succeeded in increasing mean steps/week measured 7-weeks after the first session. The intervention also increased age-expectations, and these outcomes were positively correlated. The intervention was well-tolerated, safe, and enjoyable, and participants reported subjective improvement in mood, pain, energy and sleep. These preliminary yet compelling findings suggest that attribution retraining should be rigorously tested as a potential means of increasing physical activity among sedentary older adults.

Unlike younger persons, older persons frequently attribute health problems to "old age." The novel feature of this behavioral intervention is that it draws upon the rich literature and empiric work from the field of motivational psychology (attribution theory and attribution retraining) and applies these tools to a health behavior intervention developed specifically for older adults by targeting age-attributions. This approach is distinct from applying theoretical frameworks that were developed and tested with young and middle-aged persons.[19] As pointed out by Rejeski and Brawley, [19] combining GMCB interventions with exercise programs is an innovation in physical activity research among older adults that has demonstrated encouraging success in a series of randomized efficacy trials, including Cardiovascular Health and Activity Maintenance Program (CHAMP)[26] and Shaping Active Living in the Elderly (SALE).[27] Recently, results from the first year of the Active Living Every Day program indicate that a 20-week GBCB intervention in 5 community-based settings (n=421) showed a trend towards significantly increasing moderate and vigorous physical activity in pre-post analysis (p=0.10);[28] whether

incorporating attribution retraining into these and other future GBCB interventions might enhance their effectiveness at the level of translation is an area open to exploration.

Limitations of this pilot study include the small sample size, non-randomized design, lack of a true control group, and the short duration of observation. Furthermore, the multifaceted nature of the intervention makes it impossible to determine whether the attribution retraining itself, the social contact, or even the weekly exercise class, was the driving force behind the behavior change. Because there is no evidence (to this team's knowledge) that either a weekly exercise class or social contact alone can cause even short-term sustained behavioral change, it is likely that the attribution retraining was a critical component of the intervention. Whether or not this is true should be tested, along with the efficacy and sustainability of the intervention, in a community-based randomized trial.

Though the finding that increases in age-expectations correlated with increases in steps/week is consistent with the hypothesis that increased age-expectations acts as a mediator between the intervention and increased walking, the directionality of the relationship cannot be proven with this study design. Larger studies with more frequent data collection points should attempt to tease out to what extent age-expectations drive physical activity, versus whether increasing one's physical activity causes one to raise his or her age-expectations. It will also be important in future attribution retraining trials to measure self-efficacy for physical activity, in order to explore the relationship between age-attributions, self-efficacy, and increased physical activity.

It is also important to note that this new behavioral intervention is not a "top-down" environmental and/or policy intervention; this team concurs with those who have advocated that given the health risks of sedentary lifestyle, ultimately both environmental and person-level approaches should be utilized to increase physical activity among older adults.[29] Whether environmental interventions might incorporate attribution retraining to improve health behaviors among older adults, for example via the media, is also an exciting area of health policy that has begun to be tackled by anti-ageism groups such as the International Longevity Institute.[30]

In conclusion, an intervention combining attribution retraining with a weekly exercise class raised walking levels and improved quality of life among sedentary older adults in this small pre-post community-based pilot study. Attribution retraining deserves further investigation as a potential means of increasing physical activity among sedentary older adults.

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AUTHOR CONTRIBUTIONS:

All of the authors contributed to the study concept and design, interpretation of data, and preparation of the manuscript. Dr. Sarkisian also contributed to the recruitment and enrollment of subjects and collection of data.

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Conflict of Interest Disclosures: Below is a checklist for all authors to complete and attach to their papers during submission.

Elements of Financial/Personal Conflicts	*Author 1 CS		Author 2 TP		Author 3 CD		Author 4 BW	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Employment or Affiliation		x		x		x		x
Grants/Funds		x		x		x		x
Honoraria		x		x		x		x
Speaker Forum		x		x		x		x
Consultant		x		x		x		x
Stocks		x		x		x		x
Royalties		x		x		x		x
Expert Testimony		x		x		x		x

Board Member		x		x		x		x
Patents		x		x		x		x
Personal Relationship		x		x		x		x

***Authors can be listed by abbreviations of their names.**

For "yes" x mark(s): give brief explanation below:

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Table 1. Primary Outcome Data

	Baseline	*7 weeks*	*Effect Size*	*p-value**
Mean steps/week over past week, ± SD	24749±15963	30708±19390	24%	0.002
Mean ERA-38 Scores, ± SD **	30.7±14.1	40.1±16.4	30%	0.0003
Mean MCS-12 Score, ± SD	52.1±8.5	55.3±7.9	11%	0.049
Mean PCS-12 Score, ± SD	43.6±10.4	44.2±9.7	2%	0.671
Mean # ADL impairments, ± SD	0.93±1.7	0.59±1.1	n/a	0.041

*pooled 2-sided t-test comparing mean at baseline with mean at 7-week follow-up.

** Scores on the ERA-38 range from 0-100, with higher scores indicating expecting high physical and mental functioning with aging, and lower scores indicating expecting physical and mental decline.

Figure 1. Percentage of Participants Reporting Intervention-induced Improvements in 4 Domains