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The Effect of Chair Yoga on Biopsychosocial Changes in English- and Spanish-Speaking Community-Dwelling Older Adults With Lower-Extremity Osteoarthritis

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Abstract

Chair yoga (CY), a mind-body therapy, is a safe nonpharmacological approach for managing osteoarthritis (OA) in older adults who cannot participate in standing exercise. However, there is no linguistically tailored CY program for those with limited English Proficiency (LEP). This two-arm randomized controlled trial compared the effects of a linguistically tailored yoga program (English and Spanish versions) on the outcomes of pain, physical function, and psychosocial factors compared to the effects of a linguistically tailored Health Education Program (HEP; English and Spanish versions). Participants with lower-extremity OA, recruited from two community sites, completed the Spanish ($n = 40$) or English ($n = 60$) version of twice-weekly 45-minute CY or HEP sessions for 8 weeks. Data were collected at baseline, 4 weeks, 8 weeks, and 1- and 3-month follow-ups. English and Spanish CY groups (but neither HEP language group) showed significant decreases in pain interference. Measures of OA symptoms, balance, depression, and social activities were not significantly different between English and Spanish versions of CY and English and Spanish versions of HEP. It was concluded that the Spanish and English versions of CY and HEP were equivalent. Linguistically tailored CY could be implemented in aging-serving communities for persons with LEP.

Keywords

Chair yoga; Osteoarthritis; Clinical trial; Linguistically sensitive program; Spanish-speaking older adults; Limited English proficiency

Introduction

Osteoarthritis (OA) is a common degenerative joint disease prevalent in older adults (Arthritis Foundation, n.d.a). Prevalence of OA is much higher in older age groups (50% for individuals age 65 years) than in younger age groups (29% for those age 45–64 years, Barbour et al., 2013). By 2030 as the population ages, the number of people with OA is projected to be 67 million (Hootman & Helmick, 2006). The most commonly OA affected joints are knees, hips, and ankles (Lawrence et al., 2008). Physical effects of lower-extremity OA include pain, joint stiffness, and functional impairment in activities of daily living (ADL), including limited range of motion and impaired walking ability (CDC, 2015). Older adults with unrelieved knee OA symptoms are more likely to need assistance with bathing, dressing, and transferring, which adds to the cost of their care (Nishiwaki, Michikawa, Yamada, Eto, & Takebayashi, 2011). As a consequence of functional impairment and chronic pain, OA leads to detrimental psychosocial impairment, including depression and social isolation (Lawrence et al., 2008; Rayahin et al., 2014), all of which affect quality of life (Pereira et al., 2016).

In order to manage such psychosocial impairments, it is important that social work practitioners understand OA symptoms that affect the physical, emotional, and social aspects of the older adult's life (Weathers & Creedon, 2011). Social workers, as key players in interdisciplinary health care settings, can assess how OA negatively affects emotional health and social activities and can identify evidence-based OA treatment such as cognitive behavioral therapy (Vitiello et al., 2013). Social workers can assist these populations to diagnose and address psychological impairment (e.g., depression and anxiety) and make medical referrals (Park, J., Castellanos-Brown, & Belcher, 2010). Social workers can refer older adults to movement-based mind-body interventions (e.g., yoga, tai-chi, Qigong) practiced by synchronizing movement/poses with breathing, or being mindful of body sensations during movement (Morone & Greco, 2007) to manage lower extremity OA.

Background

Nonpharmacological Approach to OA Treatment

Pharmacological treatments such as acetaminophen, anti-inflammatory drugs (NSAIDs), and opioids are often used by older adults to manage OA pain and associated symptoms (Cavalieri, 2005; Fowler, Durham, Planton, & Edlund, 2014; Phokeo & Hyman, 2007). However, older adults are at high risk for adverse events or side effects from such medications due to age-related metabolic changes and polypharmacy (Cavalieri, 2005). Adverse events related to medications can be severe, such as renal failure, gastrointestinal bleeding, falls, and even causing death (Cavalieri, 2005; Fine, 2012). These conditions contribute to poor quality of life and increased health care costs (Schieffer et al., 2005). Safe and effective nonpharmacological treatments for managing OA symptoms could reduce the need for medication, thereby lessening the side effects burden of those drugs.

The Gerontological Society of America (GSA; 2016) indicated that nonpharmacologic management should be considered to address functional and psychosocial issues associated with OA pain in older adults. Approaches include exercise-based interventions, which have

been shown to relieve OA symptoms and improve physical function (Hughes et al., 2006). It has also been demonstrated that exercise can reduce depression associated with pain, eventually improving quality of life (Herring, Puetz, O'Connor, & Dishman, 2012). In particular, older adults have perceived the movement-based mind-body exercise, including tai-chi (Waite-Jones, Hale, & Lee, 2013), yoga (Rogers & MacDonald, 2015), or Qi-gong (Chen, Hassett, Hou, Staller, & Lichtbroun, 2006), to be psychologically beneficial (Waite-Jones et al., 2013). One drawback the ability to participate in exercise declines with age; older adults who start exercise often drop out within 6 months, before receiving therapeutic benefits (Dishman, 1988).

OA Among Spanish-Speaking Hispanic Older Adults

Hispanic populations are the largest and fastest-growing minority group in the United States, constituting approximately 16% of the total population and expected to grow to 30% by 2050 (U.S. Census Bureau, 2011). OA disproportionately affects ethnic minority groups, with Hispanic older adults experiencing more activity limitations than White older adults, as well as more severe pain despite a lower prevalence of OA in Hispanic older adults (Bolen et al., 2010).

A significant number of Hispanic immigrants report limited English proficiency (LEP). In order to provide effective exercise-based programs to reduce OA symptoms in those with LEP, creating a program in the person's native language is useful. Although numerous studies (e.g., Derosé & Baker, 2000; Freeman, 2015) have focused on language barriers in the medical encounter, few (e.g., Taylor-Piliae & Froelicher, 2007) have examined exercise programs where the interventions were delivered in the native language for older adults with LEP. Older ethnic minority adults, in particular those with LEP, are generally underrepresented in clinical trials of interventions (Kim et al., 2011), chiefly due to the challenges involved in performing research in foreign languages (Taylor-Piliae & Froelicher, 2007).

Intervention studies for LEP populations have been limited (Kim et al., 2011). It is important for researchers to design studies that are linguistically tailored for each specific language groups of older adults with LEP (Li, McCardle, Clark, Kinsella, & Berch, 2001). In particular, it should be a priority to develop research teams that include bilingual data collectors and site coordinators who can communicate effectively with participants with LEP for retention (Kim et al., 2011). Previous studies have noted vulnerability for LEP populations regarding health status. Older adults with LEP have reported poor health perceptions, emotional distress, and limited physical activity more frequently than those who were proficient in English or were native speakers (DuBard & Gizlice, 2008).

Chair Yoga Program for OA Management

Yoga, a nonpharmacological mind-body therapy (National Center for Complementary and Integrative Health, 2016), involves a combination of physical postures (*asanas*), breathing (*pranayama*), relaxation (*savasana*), and meditation (Nayak & Shankar, 2004). Yoga is currently recommended by the Arthritis Foundation to provide potential benefits, including reduction of pain, stiffness, stress, and anxiety in persons with arthritis (Arthritis

Foundation, n.d.b). However, a significant number of community-dwelling older adults cannot participate in traditional yoga due to problems with balance, lack of muscle strength, or fear of falling caused by impaired balance (Park, McCaffrey, Newman, Cheung, & Hagen, 2014)

Chair yoga (CY) is practiced sitting in a chair or standing while holding the chair for support (Jerard, 2011). It is a gentle and easy-to-learn form of yoga that is appropriate for older adults who cannot participate in traditional yoga or exercise (Park et al., 2014; Park & McCaffrey, 2012; Park, McCaffrey, Dunn, & Goodman, 2011). CY has been shown to be associated with decreased pain (McCaffrey, Park, & Newman, in press), improved physical function (Park & McCaffrey, 2012), decreased depression, and improved life satisfaction (Park et al., 2014) compared to other interventions (e.g., reiki; Park et al., 2011) or to an attention control group (Health Education Program [HEP]) (Park et al., 2014). However, to date CY program study has been limited to English-speaking populations.

Because there are no data that consider the CY effects in Spanish-speaking populations, it is important to implement a linguistically tailored CY program aimed at increasing participation by Spanish-speaking older adults with LEP. The goal of the program is to improve psychosocial well-being, such as social support and quality of life for people who speak Spanish. The purpose of this study was to determine whether a linguistically tailored program (Spanish versions of CY and HEP) had effects comparable to those of the English versions of the programs in participants with LEP. This study examined the effects of a linguistically tailored yoga program (English and Spanish versions) on the outcomes of pain, physical function, and psychosocial factors compared to the effects of linguistically tailored HEP (English and Spanish versions). Both language versions were compared for both the yoga treatment and the HEP on these outcomes. The CY manual and HEP materials were translated to Spanish and provided to Spanish-speaking participants.

Methods

Study Design and Randomization

A two-arm randomized controlled trial was conducted to determine the efficacy of the 8-week CY program with 1-month and 3-month follow-ups. Prior to the initiation of the program, participants at each site were randomly assigned to either the CY program (treatment group) or the HEP (attentional control group) using a 1:1 randomization ratio in three cohorts at each of the two community sites.

The Cochrane Risk of Bias (Higgins et al., 2011) was used in the randomization sequence generation with a statistical program conducted by an independent statistician, blinded to researchers and data collectors, and allocation concealment procedures to prevent attrition. Using the SPSS 22 random number generation program, a list of randomization (A [HEP] and B [CY]) was constructed such that the A's and B's were in random order. The independent statistician who was not involved in the study provided the list of randomly generated ID numbers to the Project Directors at each site. Although the researchers and data collectors were blinded to group assignment (only site coordinator and independent statistician know group assignment), participants were not blind to group assignment.

Participants

The participants were recruited from two community sites: one low-income senior housing facility and one senior center that serves largely low-income older adults. The original intent of the study was to limit participation to English speakers. However, potential participants at one site included many who were reluctant to enroll because of limited skills in English and a preference for Spanish. Based on recognition of the language preference in the first cohort, a Spanish language component was added for the second and third cohorts.

Inclusion criteria were (a) age 65 years or older, (b) living in the community, (c) self-reported joint pain caused by OA and present in one or more lower extremity joints (e.g., knee, hip, foot, or ankle), (d) pain level of 4 or above on an 11-point numeric pain scale (0 = *no pain* to 10 = *excruciating pain*; Swanson, 2001) at least 15 days per month for 3 months or longer, (e) ability to ambulate independently with or without assistive devices, and (f) self-reported inability to participate in standing exercise. Major exclusion criteria were (a) knee or hip surgery within 12 weeks prior to enrollment, (b) systemic or intra-articular corticosteroid in the past 60 days, and (c) serious comorbidity that could interfere with the participant's ability to actively complete the CY program (e.g., chronic obstructive pulmonary disease, heart failure at a level that caused shortness of breath on exertion [Level IV], or history of Meniere's disease that could cause nausea with twisting and bending forward while sitting).

To determine whether the potential participants had OA, a board-certified nurse practitioner examined each participant. Criteria for diagnosis of OA included pain that affects lower extremity joint(s) (hip or knee) that is worse upon awakening and improves with movement, swelling of the knee, crepitus with movement, bony enlargement, and decreased range of motion (Peat et al., 2006).

Interventions

Many residents at the housing facility were more comfortable in learning and discussing issues in Spanish rather than in English. To accommodate Spanish-speaking participants for the second and third cohorts, a Spanish language component was added to the intervention design. All facets of the study (recruitment, scheduling, assessment, data collection, and the intervention) were translated into Spanish. All of the forms and programmatic material were translated into Spanish and then back translated into English by native Spanish speakers for accuracy. The Project Directors, data collectors, and intervention leaders were native Spanish speakers. The Hispanic subjects participated in the Spanish-version CY or HEP (in the second and third cohorts). The non-Hispanic subjects participated in the English-only version of CY or HEP.

CY intervention group—*Sit 'N' Fit Chair Yoga*, designed for older adults with OA, is performed while sitting in a chair with arms, for easy access and standing. The chair is used for support for the standing poses. The intervention was developed by a research team of health care providers with a yoga teacher who has taught yoga for more than 15 years and is certified by the International Yoga Alliance. The yoga intervention consists of four

components while using the support of a chair: *breath of life* (10 minutes), *body proper* (20 minutes), *warrior in the body* (5 minutes), and *mind-body connection* (10 minutes).

Participants attended twice-weekly 45-minute yoga sessions for 8 weeks, for a total of 16 sessions. Each of the three yoga cohorts at each site had no more than 10 participants, for a maximum ratio of participants to instructor of 10:1. Each site had one certified yoga instructor to provide consistency in instruction. At one of the research sites, a native Spanish-speaking yoga instructor conducted the yoga intervention. Upon completion of the 8-week yoga class, participants were given a *Sit 'N' Fit Chair Yoga* manual that provided step-by-step instructions and pictures for continuing the yoga program at home. The CY manual was translated to Spanish, back translated, and provided to Spanish-speaking participants.

HEP attention control group—In order to control for attention and time with the yoga instructors, the HEP consisted of two 45-minute sessions of health education weekly for 8 weeks. Each of the three HEP groups at each site had no more than 10 participants, for a maximum ratio of 10:1. At the sites where 90% of the residents were Spanish speaking, HEP in cohorts 2 and 3 was conducted in Spanish by the native Spanish-speaking instructor. Participants discussed general health education information and specific facts regarding OA; they did not participate in any form of yoga. The class materials and handouts were translated to Spanish.

Study Procedure

The study was approved by the participating Institutional Review Board (IRB). Eligible participants who provided informed consent were randomized to either an intervention group (CY) or an attention control group (HEP). Data collectors received safety training on body mechanics and how to administer physiologic measures.

For the second cohort, Spanish-speaking participants at one research site were recruited because many residents at the site were more comfortable in communicating in Spanish. The 4-week, 8-week, and 1-month and 3-month follow-up data collections were conducted in Spanish. The site coordinator, research assistant, data collectors, and intervention leader were native Spanish speakers.

In this study, the researchers received strong requests from the population at the senior housing facility for a Spanish version of the protocol to make it more acceptable. For the second and third cohorts, baseline assessment and interventions were conducted in Spanish. At the other site, the intervention and data collections were conducted in English. Adherence was considered met if the participant attended at least 12 of the 16 sessions. Fidelity of CY was ensured by the CY program developer and fidelity of HEP was ensured by the site coordinators, as 20% of the sessions were assessed through observation using a standardized checklist.

Outcome Measures

Demographic information, physical measures, and psychosocial measures were collected prior to randomization (baseline data collection) by blinded data collectors. All forms and

data collection tools were translated into Spanish and verified by interpreters. The three physical or psychosocial measurement tools (The PROMIS Pain Interference-Short Form [PI-SF] V. 1.0-8a; Emotional Distress and Depression-V 1.0 SF-8a; Ability to Participate in Social Activities-V 2.0 SF-8a) were from the Patient Reported Outcome Measurement System (PROMIS) system, a repository of highly reliable precise measures of patient-reported health status for physical, mental, and social well-being. Most of the physical and psychosocial measurement tools were from the Patient Reported Outcome Measurement System (PROMIS) system, a repository of highly reliable, precise measures of patient-reported health status for physical, mental, and social well-being. PROMIS is part of a National Institutes of Health (NIH) Roadmap project (Liu et al., 2010).

Three measures were selected for initial item-bank development: pain interference, depression, and social role participation. All measures were used as physical or psychosocial outcomes: (a) The PROMIS Pain Interference-Short Form (PI-SF) V. 1.0-8a, (b) Emotional Distress and Depression-V 1.0 SF-8a, (c) Ability to Participate in Social Activities-V 2.0 SF-8a, and physical assessment measurements, (d) Berg Balance Scale (BBS), and (e) self-description tools (Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC]).

The 8-item PROMIS PI-SF V. 1.0-8a was administered to assess self-reported consequences of pain (pain interference) on various aspects of the participant's life within the previous 7 days, using a 5-point response scale ranging from *not at all* to *very much* (Askew et al., 2013). Alpha reliability ranges from .96 to .99 and construct validity is adequate (Amtmann et al., 2010). Scores can range from 8 to 40. A higher score indicates more interference (NIH, 2015).

The PROMIS Emotional Distress and Depression V 1.0 SF-8a was administered to measure depressive symptoms. The tool has a 5-point scale for each item (1 = *Never* to 5 = *Always*); scores can range from 8 to 40. Higher scores indicate higher levels of depression and emotional distress (NIH, 2015).

The PROMIS Ability to Participate in Social Activities V 2.0 SF-8a was administered to measure the perceived ability to perform usual social roles and activities. Items are worded negatively in terms of perceived limitations (5 = *Never* to 1 = *Always*), but responses are reverse coded so that higher scores represent fewer limitations. Scores can range from 8 to 40; higher scores indicate lower ability to participate in social roles (NIH, 2015).

The WOMAC (Bellamy, 2013) was administered to measure self-reported OA symptoms (pain, stiffness, functional ability). The tool is a self-administered scale with 24 items (pain 5 items, stiffness 2 items, physical function 17 items), using a Likert-type scale. Scores can range from 0 to 96. Higher scores indicate worse pain, stiffness, and functional limitations (Bellamy, 2013). Cronbach's alpha was .95 for pain and .91 for functional ability in several tests in persons with OA (Baron, Tubach, Ravaud, Logeart, & Dougados, 2007).

The BBS, the gold standard assessment for balance, was administered. The performance-based BBS (Berg, Wood-Dauphinee, Williams, & Gayton, 1989) contains 14 items applying a 5-point scale for each item (0 = *lowest level of function* to 4 = *highest level of function*);

scores range from 0 to 56. Intra-rater reliability ($ICC = 0.68\text{--}0.99$) and interrater reliability ($ICC = 0.88\text{--}0.98$) were acceptable, as was internal validity (Bennie et al., 2003).

Statistical Analysis

SPSS software version 24.0 for Windows (IBM Corp, Summers, NY) and HLM 7.01 (SSI International) were used to conduct (a) preliminary data analyses, including descriptive statistics, management of missing data; (b) chi-square for examining group differences in recruitment of English-speaking and Spanish-speaking participants; (c) one-way analysis of variance (ANOVA) for measuring group difference in attendance between English-speaking and Spanish-speaking participants; (d) hierarchical linear modeling (HLM; McCulloch & Searle, 2001); and (e) the Missing Value Analysis (MVA; Baraldi & Enders, 2010) function to identify the extent, randomness, and pattern of missing data.

HLM was the most appropriate analysis technique because of its flexibility in reflecting change over time for individual subjects (Newman & Newman, 2012; Raudenbush & Bryk, 2002). Thus, in the examination of model growth parameters, the intercept represented the level of outcome of the baseline assessments and the slope indicated the rate at which the level was changing. Two grouping factors, each with two levels (treatment: CY, HEP; language: Spanish, English) were used, resulting in four groups (a) CY English, (b) HEP English, (c) CY Spanish, and (d) HEP Spanish.

Results

Study Sample

A total of 137 persons were screened but 6 participants were excluded due to ineligibility; 131 participants were assigned to CY ($n = 66$) or HEP ($n = 65$). However, 13 dropped out of the study after randomization but prior to the intervention because of unwillingness to be in the control group or due to family issues. As a result, 112 participants completed the intervention.

Data for 12 Spanish-speaking participants who attended the English version of CY or HEP (first cohort) were eliminated from analyses to facilitate components of language match between groups (English-version match, Spanish-version match). This resulted in a final sample of 100 (English version $n = 60$ [CY = 32, HEP = 28], Spanish version $n = 40$ [CY = 20, HEP = 20]) for data analysis (see CONSORT flow diagram, Figure 1).

The mean age of the participants was 75.3 years ($SD = 7.5$), range 65 to 94 years. A majority of the 100 participants were female (75%, $n = 75$); ethnicity was relatively equally distributed among Hispanic older adults (40%, $n = 40$), non-Hispanic White older adults (45%, $n = 45$), and other ethnic groups (15%, $n = 15$). More than half (64.3%, $n = 72$) were living alone. All of the Hispanic older adults in the analysis pool attended the Spanish version CY or HEP; members of other ethnic groups attended the English version of CY or HEP.

Recruitment and Retention

The study found no significant group differences in recruitment and retention between English-speaking and Spanish-speaking participants. The study achieved a high adherence rate (95%); both English-speaking and Spanish-speaking participants attended at least 12 of the 16 sessions. An adverse event (AE) is any untoward medical occurrence in a participant during participation in the study, regardless of relationship to study intervention. AEs from attending the CY session could include increased pain, muscle ache/cramping, fatigue, or any combination of these. No AEs or Serious Adverse Events (SAEs) associated with the intervention were reported during the intervention. Group differences in recruitment were not significant, $p = .893$, $\chi^2(1) = .18$. Group differences in attendance were not significant, mean 14 of 16 sessions, $p = .344$, $F(3, 92) = 1.123$.

Primary Results

Table 1 reports means and standard deviations of pain interference, OA symptoms, balance, and psychosocial outcomes across time. This study addressed the differences in pain and pain interference, physical function, and social and emotional well-being for participants in four groups: (a) English CY, (b) English HEP, (c) Spanish CY, and (d) Spanish HEP.

Pain Interference

There were no significant between-group differences in pain on pretest scores (English HEP $\beta = 18.70$ reference group, English CY $\beta = 21.01$, $p = .23$, Spanish HEP $\beta = 17.66$, $p = .63$, Spanish CY $\beta = 15.60$, $p = .15$). The fixed-effects model indicated a significantly greater decrease in pain interference for both the English and Spanish CY groups over time (English CY $\beta = -1.16$, $p = .012$; Spanish CY $\beta = -1.02$, $p = .042$) but no significant decrease for either HEP language group (English HEP $\beta = 0.02$, $p = .954$; Spanish HEP $\beta = -0.04$, $p = .908$). The random-effects model indicated a statistically significant overall decrease in pain interference across time regardless of treatment group ($p < .001$; Table 2).

Balance

There were no significant between-group differences in balance (English HEP $\beta = 29.10$, reference group, English CY $\beta = 33.06$, $p = .067$, Spanish HEP $\beta = 32.85$, $p = .118$, Spanish CY $\beta = 31.96$, $p = .231$). The fixed-effects model indicated no statistically significant increase in balance across groups (English HEP $\beta = .28$, $p = .411$; English CY $\beta = .22$, $p = .881$; Spanish HEP $\beta = 0.32$, $p = .94$) but the Spanish CY group approached statistical significance (Spanish CY $\beta = 1.23$, $p = .055$). The random-effects model indicated no significant improvement in balance for all four groups combined ($p > .500$).

WOMAC OA Symptoms

There was a significant difference between English and Spanish groups at baseline on WOMAC OA symptoms, with both English HEP and English CY scoring higher than Spanish CY or Spanish HEP (English HEP $\beta = 37.08$ reference group, English CY $\beta = 31.53$, $p = .223$, Spanish HEP $\beta = 26.39$, $p = .037$, Spanish CY $\beta = 24.36$, $p = .013$). While controlling for the starting point, the fixed-effects model indicated no statistically significant trend differences among the four groups except for English HEP, which showed less

improvement over time (English HEP $\beta = -1.85$, $p = .015$, English CY $\beta = -1.91$, $p = .947$, Spanish HEP $\beta = -1.92$, $p = .531$, Spanish CY $\beta = -2.96$, $p = .303$). The random-effects model indicated a significant decrease in WOMAC for all four groups combined ($p < .001$; Table 2).

Depression

There were no significant between-group differences in depression (English HEP $\beta = 14.00$, reference group, English CY $\beta = 14.73$, $p = .631$, Spanish HEP $\beta = 13.44$, $p = .739$, Spanish CY $\beta = 12.33$, $p = .319$). Likewise, the fixed-effects model indicated no significant decrease in depression (English HEP $\beta = .07$, $p = .807$; English CY $\beta = -.46$, $p = .139$; Spanish HEP $\beta = -.24$, $p = .438$; Spanish CY $\beta = -.25$, $p = .419$). The random-effects model indicated a significant improvement in depression across time for all groups ($p < .001$).

Social Activities

There were significant differences between the English and Spanish groups at baseline on social activities, with both the Spanish HEP and CY groups (Spanish HEP $\beta = 30.87$, $p = .001$; Spanish CY $\beta = 32.71$, $p < .001$) scoring higher than the English HEP or CY group (English HEP $\beta = 23.13$, reference group, English CY $\beta = 23.96$, $p = .695$). The fixed-effects model indicated no significant increase in social activities across all groups, but both Spanish groups had less improvement, with the HEP group approaching significance (Spanish HEP $\beta = -.37$, $p = .064$; Spanish CY $\beta = .06$, $p = .292$) compared to the English group (English HEP $\beta = .61$, $p = .095$; English CY $\beta = .89$, $p = .569$). The random-effects model indicated a statistically significant overall increase in social activities across time, regardless of treatment group ($p < .001$).

Discussion

Previous studies with a quasi-experimental (Park et al., 2014) or pretest/posttest design (Park & McCaffrey, 2012) indicated that CY contributed to OA-associated pain reduction, functional improvement, and psychosocial well-being (McCaffrey, Park, & Newman, in press) for older adults. The study provided Spanish versions of the interventions. This study produced the first evidence that linguistically appropriate interventions (Spanish versions of CY and HEP) were valued by the population being studied and were equivalent to English versions of the interventions and comparatively effective in managing such OA symptoms. The most significant finding was that participants in both CY groups (English and Spanish versions) showed significantly greater decreases in pain interference associated with ADL and limited functional (e.g., household chores, grocery shopping) and social (e.g., leisure activities with others) activities compared to the HEP groups. Thus, it was concluded that there can be effects of CY regardless of the language in which the intervention is conducted.

It is plausible that successful recruitment and retention of Spanish participants may be a result of bilingual data collectors, bilingual interventionists (i.e., CY and HEP instructors), and tailored resources (Spanish version of the CY manual and HEP materials) for Spanish-speaking participants, in addition to face-to-face communication between language-concordant staff and participants.

Although there is evidence that yoga provides reduction in OA symptoms (Cheung, Wyman, Resnick, & Savik, 2014), this is the first randomized controlled trial to examine the effect of CY among English-speaking and Spanish-speaking older adults with OA who are not able to participate in strenuous or standing exercise. It can be concluded that *Sit 'N' Fit Chair Yoga* is a linguistically sensitive mind-body program designed for older adults with OA that produces positive outcomes in biopsychosocial changes.

While the difference in OA pain, measured by WOMAC, was not statistically significant in CY compared to HEP, CY helped participants to engage in activity to promote physical, social, and emotional well-being despite chronic pain (McCaffrey, Park, & Newman, in press). On the other hand, WOMAC OA symptoms (pain, stiffness, limited physical function), balance, depression, and social activities were not significantly different between English and Spanish versions of CY or English and Spanish versions of HEP. These findings indicate that linguistically appropriate interventions were comparably effective.

It can be concluded that CY reduced pain interference and that language-appropriate versions of the program increased participation by a group that might otherwise be unstudied. The other physical and psychosocial outcomes were not significantly different between CY and HEP groups, regardless of language. However, although not statistically significantly different between interventions, pain, balance, depression, and social activities improved over time, regardless of language preference and intervention.

Participants in the HEP group received health education information and specific facts related to the effects of OA. Participants were engaged in discussion and activities. Thus, it is possible that participants were socially connected, which may have influenced the results for depressive symptoms and social activities. There was no significant difference between Spanish and English versions; this finding supports the conclusion that the Spanish version of HEP was equivalent to the English version of HEP.

Like all studies, there were strengths and weaknesses. The major weaknesses were related to the limited ability to generalize findings and potential for cross-contamination. Although random assignment was a strength of this clinical trial, given that the participants were randomized at each site, there was potential for contamination across CY and HEP groups when they engaged in shared activities at the community center. The issue of generalizability arose because participants were recruited from two community centers, both of which served low-income older adults. Therefore, findings may not be generalized to different settings or populations with different socioeconomic circumstances. This study's strengths include a rigorous randomization process, a high adherence rate, and language tailoring for Spanish-speaking participants.

Implications

This CY program could be one nonpharmacological pain management plan for older adults with OA, especially for those who are unable to participate in formal exercise. The findings in the study have implications for research, practice, education, and policy. The findings support the conclusion that the Spanish versions of CY and HEP were equivalent to the English versions of CY and HEP. Application of the *Sit 'N' Fit Chair Yoga* program should

be further examined by comparing other types of alternative therapies, such as gentle exercise or chair Zumba, to assess their effects on pain, physical function, and psychosocial well-being. Attention should be paid to sensitive measures of physical function (e.g., temporal spatial parameters that affect balance and mobility) to enhance structure and sensitivity for balance and gait-related measures of function, an important contributor to independence and quality of life (Morey et al., 2008).

Although *Sit 'N' Fit Chair Yoga* is a linguistically sensitive CY program and this study included culturally sensitive and bilingual data collectors, the program was not culturally tailored as a CY intervention. Given the growing number of LEP immigrant populations (Zong & Batalova, 2015), it is necessary to translate CY programs into a range of languages, in addition to Spanish, to disseminate linguistically tailored CY to a wider range of LEP participants. It is also important to investigate whether it is necessary to design culturally sensitive CY programs for LEP immigrants or whether linguistically tailored CY programs are sufficient for this population. Focus groups consisting of community members who are representative of unique LEP populations, especially those who have participated in the *Sit 'N' Fit Chair Yoga* program, could inform future research about the need for cultural tailoring.

Because CY is easy to follow and relatively safe, social workers could recommend CY practice to older adults with OA, particularly encouraging linguistically diverse clients to choose bilingual yoga instructors who have experience in working with older adults with OA to help them to manage OA symptoms. CY components can be easily integrated into social activities in senior center and congregated living facilities. Social workers could also help older adults with OA to create social networks by participating in CY (Park et al., 2011). Although social workers should not conduct CY sessions without certification, they could incorporate elements (e.g., breathing technique, relaxation, and meditation) into social work interventions. HEP, as an attention control group, showed improved social activities and reduced depression. Thus, social workers may integrate these types of intervention into their treatment plan for older clients with OA.

Although the participants in the current study were enrolled in Medicare, there is generally limited coverage of nonpharmacological treatments such as acupuncture and yoga. Limiting such coverage may have a detrimental effect on those who could benefit from nonpharmacological treatment, in particular those who cannot receive pharmacological treatment due to adverse drug events (Park, Hirz, Manotas, & Hooyman, 2013). Research on the implications of Medicare policy is needed to determine whether the level of co-pay or limitations on type of specialty care affect outcomes.

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Figure 1.
Flow diagram of participant progress through the randomization phase.

Table 1

Within-Group Mean Changes (Standard Deviations) From Baseline in outcomes by Time and Treatment Group

Significant outcomes with (score range)	English HEP					English Yoga					Spanish HEP					Spanish Yoga				
	L	1	2	3	4	L	1	2	3	4	L	1	2	3	4	L	1	2	3	4
Pain Interference (8-40)	9.8	8.5	8.6	0.3	8.8	0.7	0.0	7.0			8.1	6.3	8.3	8.6	6.6	6.0	5.4	2.2	1.5	3.0
WOMAC Total (0-96)	9.8	3.3	4.3	4.0	0.1	4.3	0.2	4.4	7.3	5.3	7.1	4.3	1.5	8.7	5.9	6.4	0.9	6.3	3.1	5.6
Balance (0-56)	7.2	9.0	1.3	1.8	9.4	1.2	4.4	4.2	3.8	3.2	3.4	2.8	4.0	3.1	5.3	1.0	4.0	5.3	5.7	6.2
Depression (8-40)	0.6	2.4	.9	0.2	0.6	.0	.5	.0	0.1	.9	.8	.3	.7	.3	.0	.2	.2	.6	.7	.3
	4.2	4.1	4.1	4.4	4.3	4.7	4.2	3.3	4.2	2.5	4.9	1.7	2.5	2.4	3.2	2.7	2.5	0.5	1.8	1.9
	.4	.1	.3	.8	.1	.8	.4	.8	.3	.0	.3	.6	.4	.2	.4	.8	.6	.5	.0	.2
Social Activity (8-40)	3.8	2.7	3.6	6.5	6.1	3.1	5.3	8.5	5.2	7.5	2.0	9.2	0.0	9.8	9.6	2.7	2.9	3.0	2.5	3.1
	1.5	0.1	0.1	.5	0.7	.4	.9	.7	.9	.1	.5	.5	.1	.5	.4	.9	.0	.4	.3	.4

Note. BL = baseline, T1 = after 4 weeks of the intervention, T2 = after 8 weeks of the intervention, T3 = 1 month after conclusion of the intervention, T4 = 3 months after conclusion of the intervention. Pain Interference: a higher score implies more interference. WOMAC total: higher scores indicate worse OA symptoms. Balance: high scores indicate lower fall risk. Depression: high scores indicate higher levels of depression. Social Activity: higher scores indicate lower ability to participate in social roles.

Table 2

Fixed and Random Effects of Chair Yoga (CY) 8-Week Intervention on Pain Interference

Scale	Effects	<i>B</i>	<i>SE</i>	<i>t-ratio</i>	<i>df</i>	<i>p</i>
Pain						
Interference	Fixed Effects					
	For INTRCPT1, π_0					
	English HEP	18.70	1.48	12.67	90	<.001
	English CY	21.01	1.91	1.21	90	.23
	Spanish HEP	17.66	2.13	-0.49	90	.627
	Spanish CY	15.60	2.13	-1.45	90	.15
	For DATA_POI slope, π_1					
	English HEP	0.02	0.35	0.06	90	.954
	English CY	-1.16	0.46	-2.56	90	.012
	Spanish HEP	-0.04	0.51	-0.12	90	.908
	Spanish CY	-1.02	0.51	-2.06	90	.042
	Random Effect					
	INTRCPT1, r_0	5.81	33.77	90	309.50	<.001
	DATA_POI slope, r_1	.52	0.27	90	99.45	.232
	level-1, e	4.76	22.67			
WOMAC	Fixed Effects					
	For INTRCPT1, π_0					
	English HEP	37.08	3.48	10.64	90	<.001
	English CY	31.53	4.52	-1.23	90	.223
	Spanish HEP	26.39	5.04	-2.12	90	.037
	Spanish CY	24.36	5.04	-2.52	90	.013
	For DATA_POI slope, π_1					
	English HEP	-1.85	0.74	-2.48	90	.015
	English CY	-1.91	0.97	-0.07	90	.947
	Spanish HEP	-1.92	1.07	0.63	90	.531
	Spanish CY	-2.96	1.07	-1.04	90	.303
	Random Effect					
	INTRCPT1, r_0	15.01	225.29	90	585.52	<.001
	DATA_POI slope, r_1	2.18	4.74	90	152.55	<.001
	level-1, e	8.27	68.34			
Berg Balance	Fixed Effects					
	For INTRCPT1, π_0					
	English HEP	29.10	1.64	17.75	90	<.001
	English CY	33.06	2.13	1.86	90	.066
	Spanish HEP	32.85	2.38	1.58	90	.118
	Spanish CY	31.96	2.37	1.21	90	.231
	For DATA_POI slope, π_1					
	English HEP	0.28	0.34	0.83	90	.411

Scale	Effects	<i>B</i>	<i>SE</i>	<i>t-ratio</i>	<i>df</i>	<i>p</i>
Social Activity	English CY	0.22	0.44	-1.50	90	.881
	Spanish HEP	0.32	0.50	0.08	90	.94
	Spanish CY	1.23	0.49	1.95	90	.055
	Random Effect	<i>SD</i>	<i>VC</i>	<i>df</i>	χ^2	<i>p</i>
	INTRCPT1, τ_0	6.68	44.61	90	352.73	<.001
	DATA_POI slope, τ_1	0.09	0.01	90	74.25	>.500
	level-1, e	4.89	23.96			
	Fixed Effects	<i>B</i>	<i>SE</i>	<i>t-ratio</i>	<i>df</i>	<i>p</i>
	For INTRCPT1, π_0					
	English HEP	23.13	1.62	14.29	90	<.001
Depression	English CY	23.96	2.10	0.39	90	.695
	Spanish HEP	30.87	2.35	3.30	90	.001
	Spanish CY	32.71	2.35	4.09	90	<.001
	For DATA_POI slope, π_1					
	English HEP	0.61	0.36	1.69	90	.095
	English CY	0.89	0.47	0.57	90	.569
	Spanish HEP	-0.37	0.52	-1.88	90	.064
	Spanish CY	0.06	0.52	-1.06	90	.292
	Random Effect	<i>SD</i>	<i>VC</i>	<i>df</i>	χ^2	<i>p</i>
	INTRCPT1, τ_0	6.69	44.80	90	415.90	<.001
	DATA_POI slope, τ_1	0.80	0.63	90	123.21	.012
	level-1, e	4.61	21.28			
	Fixed Effects					
	For INTRCPT1, π_0					
	English HEP	14.00	1.16	12.12	90	<.001
	English CY	14.73	1.50	0.48	90	.631
	Spanish HEP	13.44	1.67	-0.33	90	.739
	Spanish CY	12.33	1.67	-1.00	90	.319
	For DATA_POI slope, π_1					
	English HEP	0.07	0.27	0.25	90	.807
	English CY	-0.46	0.35	-1.49	90	.139
	Spanish HEP	-0.24	0.39	-0.78	90	.438
	Spanish CY	-0.25	0.39	-0.81	90	.419
	Random Effect	<i>SD</i>	<i>VC</i>	<i>df</i>	χ^2	<i>p</i>
	INTRCPT1, τ_0	4.93	24.33	90	528.57	<.001
	DATA_POI slope, τ_1	0.85	0.72	90	168.27	<.001
	level-1, e	2.89	8.33			