

Latinos Unique Scenario, Addressing Cognitive Impairment via Dance

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THESIS

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LIST OF ABBREVIATIONS

PA	Physical Activity
SB	Sedentary Behavior
MCI	Mild Cognitive Impairment
AD	Alzheimer's Disease
CVD	Cardiovascular Disease
MMSE	Mini Mental State Examination
APOE-e4	Apolipoprotein 4
BMI	Body Mass Index
RPE	Rate of Perceived Exertion
AWC	Adult Wellness Center
ADS	Adult Day Service
CRF	Cardiorespiratory Fitness
MVPA	Moderate-to-Vigorous Physical Activity
SBQ	Sedentary Behavior Questionnaire
GDS-15	Geriatric Depression Scale-15
LLFDI	Late Life Function and Disability Instrument
MET	Metabolic Equivalent
TUG	Timed Up and Go
SPPB	Short Physical Performance Battery
QOL-AD	Quality of Life-Alzheimer's Disease

SUMMARY

A pilot, randomized controlled study was conducted to investigate the feasibility and impact of a Latin dance program on older Latinos with mild cognitive impairment. Spanish-speaking older Latinos were randomized into a 16 week, twice-weekly dance intervention or to a wait-list control group; the wait-list control group crossed over at week 17 and received the dance intervention. Feasibility was determined by assessing reach, retention, adherence, dance logs, dance evaluations, and focus groups post-intervention. Participants were given a GT3X+ accelerometer and ActivPAL to wear for 7 consecutive days. Questionnaires assessing cognition, physical function, cardiorespiratory fitness, sedentary behavior, quality of life, and depression were administered.

Findings indicate that participants found the Latin dance program as an appealing, enjoyable, and safe mode of physical activity. Our intervention was shown to have modest adherence (55.76 %). Not including the dropouts, the intervention adherence was 85%.

The dance group decreased their accelerometer counts and increased their sedentary time. Dance and control groups increased their cardiorespiratory fitness which may be indicative of contamination effects or participation in other activities at the adult wellness center. The study also revealed modest effects in cognitive function specifically on declarative memory and executive function. Both groups also improved their Chair stand and Timed Up and Go times which has positive clinical implications.

I. INTRODUCTION

A. Significance

By 2060, 21.5% of the older population in the U.S. will be comprised of Latinos ((AoA), 2015). Latinos have the lowest leisure time physical activity (PA) rates among all ethnic/racial groups, independent of social class, (Crespo et al., 2000, Ham et al., 2007, He and Baker, 2005, Marshall et al., 2007, Slattery et al., 2006) and many older Latinos do not have a history of engaging in traditional exercise (Cromwell and Berg, 2006a). Older Latinos are vulnerable to lower PA rates because of a combination of individual (e.g., low education and income levels)(Betancourt et al., 2004, Ramirez and De la Cruz, 2003) and environmental factors (e.g., lack of safety due to neighborhood crime) (Evenson et al., 2003). Furthermore, older adults with lower educational attainment may have less leisure time options which result in engaging in sedentary behaviors such as TV viewing, (Kikuchi et al., 2013) which pose as another independent risk factor for metabolic diseases (Prince et al., 2014b). Latinos have 1.5 times the risk of diabetes (Baxter et al., 1993, Winkleby et al., 1998) and twice the incidence of Alzheimer's disease (AD) (Tang et al., 2001) compared to non-Latino whites. In part due to low levels of PA and increased diabetes rates, older Latino adults have higher rates of disability compared to non-Latino white counterparts.

It is currently unknown whether PA such as dance that integrates balance, endurance, and weight-shift transitions is more effective at minimizing disablement than traditional PA or exercise (Keysor, 2003). We know that behavioral interventions targeting early stages of the disablement process such as poor cognitive function have the potential to prevent or delay disability (Popa et al., 2009).

Persons with low socioeconomic status (SES) are at elevated risk of developing AD (Stern et al., 1994). Specifically, 21.4% of Latinos live in poverty, compared with 7.8% of non-Latino whites (Ramirez and De la Cruz, 2003). Poor cognitive performance is also a precursor of disability (Zsembik et al., 2000). A broad range of studies including animal models, (Berchtold et al., Cotman et al., 2007, Nichol et al., 2009, Parachikova et al., 2008) exercise interventions targeting cognitive performance, (Colcombe and Kramer, 2003, Kramer et al., 2003) and fitness correlations observed with preserved brain structure (Colcombe et al., 2003b, Colcombe et al., 2006, Kramer et al., 2003) support the hypothesis that PA protects against cognitive decline. Furthermore, vascular risk factor control via PA may reduce risk of progression from mild cognitive impairment (MCI) to dementia (Langa and Levine, 2014). However, previous PA-cognition intervention studies suffer from major limitations, including that no studies have examined findings by racial/ethnic group. The need to test PA interventions that have the potential to reduce the loss of cognitive function among older Latinos, a group at elevated risk of health disparities, is of high public health importance (Williamson et al., 2009).

Moreover, results from intervention studies examining the effect of PA on cognition in older adults with MCI and dementia are scarce (Bherer et al., 2013). Those completed have found that aerobic exercise and resistance training are associated with small to moderate improvements in cognitive function, particularly measures of attention, processing speed and executive function (Baker et al., 2010, Lautenschlager et al., 2008a, Nagamatsu et al., 2012). Interestingly, these studies have varied in the exercise “dosage” given to participants (Lautenschlager et al., 2008a). Lautenschlager and colleagues had participants complete three 50-minute sessions/week of individualized home-based PA (which mostly consisted of walking and some strength training) over 6 months (Nagamatsu et al., 2012). Nagamatsu et al. had

participants complete strength training on 2 days/week for 60 minutes/session over the course of 6 months. Baker et al. had participants engage in a walking program 4 days/week for 45-60 minutes/session (75%/85% maximum heart rate) over 6 months (Baker et al., 2010). In healthy older adults positive gains in cognition can be impacted in short-term PA interventions as short as three months in duration (Colcombe and Kramer, 2003). Studies are required to understand the frequency, intensity, duration, and types of exercise that better enhance cognitive functions (Bherer et al., 2013); and to determine the effects of different exercise types on cognition in older adults with MCI, as it is likely that different exercise types are more effective in certain individuals (Farina et al., 2014).

In addition to interventions examining the effect of PA on cognitively impaired older adults, studies are also needed to examine the impact of sedentary behavior (SB) on cognitive outcomes, given that SBs account for 50% of waking hours (Voss, 2014). Most studies have examined the metabolic effects associated with SB, which are known to affect cognition; unfortunately very few have examined the direct impact of SB on cognition (Voss, 2014). A cross-sectional study that examined the health effects of SBs in healthy older adults found a negative association between TV viewing and executive functioning (Kesse-Guyot et al., 2012). Hamer et al. conducted a prospective study among a cohort of community dwelling older adults and found that TV viewing time was associated with higher depressive symptoms and worse global cognitive function (Hamer and Stamatakis, 2014). Another study that examined the association of breaks in sedentary time with biological markers of metabolic risk found that more interruptions were beneficially associated with metabolic markers such as waist circumference, body mass index (BMI), triglycerides, and 2-hr plasma glucose (Healy et al., 2008). Given the evidence that SB and PA both affect metabolic function, it is possible they have overlapping

pathways and interact in their effect on cognitive function (Voss, 2014). Current evidence supports that reductions and breaks in sedentary time can be produced in PA interventions that include a degree of focus on reducing sedentary behavior (Prince et al., 2014b). Studies that integrate objective and subjective measurements of both SB and PA with cognitive measures among healthy and cognitively impaired older adults are needed in order to expand the evidence (Prince et al., 2014b).

Given that many modes of PA have been shown to impact the cognitive and physical functioning in older adults with MCI, attempts to increase the PA of older Latinos should use culturally appropriate forms of PA (Cromwell and Berg, 2006a). Some forms of PA are not considered age- or gender-appropriate by older Latinos, (Melillo et al., 2001) who are known to prefer music, singing, and dance as ways to remain physically active (Belza et al., 2004). Dancing and walking have been cited as the only age-appropriate PA for older Latina women (Cromwell and Berg, 2006a). Older Latinos understand the physical and psychological benefits of exercise (Melillo et al., 2001). However, this understanding has not led to their adoption and maintenance of PA. Thus, it is of importance to test innovative methods that can increase PA adoption and maintenance, and reduce sedentary time and increase sedentary breaks, and their attendant cognitive and physical outcomes.

Dance has long been an important form of socialization, entertainment, and leisure in Latin cultures (Delgado and Munoz, 1997, Lewis, 1994). Dance challenges individuals both physically and cognitively. The limited literature that has examined the effects of dance on the health of older adults indicates that dance can significantly improve participants' lower extremity function, including mobility, strength, flexibility, balance, and gait (Keogh et al., 2009). Dance also requires individuals to plan, monitor, and execute a sequence of complex actions, potentially

making it ideal for preventing executive function decline. Moreover, dance is enjoyable,(Judge, 2003) which will likely lead to increased maintenance (Robinson et al., 2003).

B. Specific Aims

By 2060, 21.5% of the older population in the U.S. will be comprised of Latinos ((AoA), 2015). Disparities exist between Latinos and non-Latino whites in cognitive and physical function, putting Latinos at increased risk for MCI, dementia and disability. Latinos have twice the incidence of

Alzheimer's disease (AD) compared to non-Latino whites,(Tang et al., 2001) and the number of Latinos in the U.S. with AD is projected to increase by 600% in the next 50 years (Novak and Riggs, 2010). Latinos have a greater risk of developing chronic conditions involving modifiable lifestyle factors,(August and Sorkin, 2011) and evidence suggests that cardiovascular disease risk factors may also be a risk for AD, thus putting Latinos at greater risk for AD (O'Bryant et al., 2013). Furthermore, persons with low socioeconomic status (SES) also have twice the risk of developing AD (Stern et al., 1994). A considerable proportion of older Latinos in the U.S. have low SES, and are thus at increased risk for AD. Moreover, older Latinos have poor physical function, and are almost twice as likely to report difficulty walking than non-Latino whites (Ostchega et al., 2000). Importantly, functional capacity is recognized as a classic marker of MCI and AD (Balsamo et al., 2013).

Pharmacological treatments available for cognitive decline/dementia have shown limited effectiveness in reducing cognitive and functional decline (Lyketsos et al., 2006) and the development of new interventions that can treat or reduce the needs of people with dementia is critical (Vreugdenhil et al., 2012). Physical activity (PA) should be a central element in interventions targeting improved cognitive function and disability reduction in older adults, as

there is a 29% to 50% lower risk of developing AD for those who engage in regular PA (Scarmeas et al., 2009). Regular PA is also associated with lower incidence and prevalence of chronic diseases such as heart disease, diabetes, and cancer (Booth et al., 2012, Blair and Morris, 2009). Unfortunately, Latinos aged 65-74 are 46% less likely to engage in leisure time PA than older non-Latino whites (Marquez et al., 2010). Older Latinos participate in an average of 11 minutes of PA per day, (U.S. Department of Health and Human Services; National Institutes of Health; National Heart, 2013) while the recommendation is to obtain 30 minutes, 5 or more days per week to gain health benefits. Along with low levels of PA, Latinos are more likely to report engaging in leisure time sedentary behavior (Marshall et al., 2007). Sedentary behaviors are defined as seated or reclining postures in waking hours that involve an energy expenditure of ≤ 1.5 metabolic equivalents and is not simply the absence of PA (Owen et al., 2010). Passive sedentary behavior, e.g., TV viewing, is positively associated with cognitive decline (Kesse-Guyot et al., 2012, Hamer and Stamatakis, 2014) independent of physical activity. Thus, in addition to increasing PA, interventions should also target reducing sedentary time and focus on breaking up prolonged sedentary time as there is evidence to support that breaking up sedentary time provides beneficial metabolic effects, which in turn can impact cognition. (Healy et al., 2008).

Walking and dancing are the two most commonly reported forms of PA among older Latinos (Ramirez et al., 2007). However, urban older Latinos cite unsafe neighborhoods and extreme weather conditions as significant barriers to walking. Dance holds considerable promise as a culturally appropriate form of PA that challenges individuals both cognitively and physically. Dance requires individuals to plan, monitor, and execute a sequence of goal-directed complex actions, potentially making it ideal for improving cognitive function. A 2013 study

found that 6-months of dancing had a positive impact on cognition in older adults, even without influencing cardiorespiratory fitness (Kattenstroth et al., 2013). Another prospective study found that dancing was among one of the few leisure activities associated with a reduced risk of dementia among older adults (Verghese et al., 2003). It has been reported that three lifestyle factors can play a significant role in slowing the rate of cognitive decline and preventing dementia: a socially integrated network, cognitive leisure activity, and regular PA (Fratiglioni et al., 2004). It can be argued that dancing is one of the few activities that addresses these three factors with one activity.

A review in 2004 found that exercise training increases fitness, physical function, cognitive function, and positive behavior in people with dementia and related MCI (Heyn et al., 2004b). More recent reviews on the effectiveness of exercise on MCI and AD in 2013 (Balsamo et al., 2013) and 2014 (Farina et al., 2014) still indicate positive evidence for structured PA (aerobic and resistance exercise) as a promising non-pharmacological alternative for preventing cognitive decline. There is also evidence to support that a higher level of total daily physical activity is associated with a lower risk of AD (Buchman et al., 2012). However, the variation between study designs makes conclusions regarding the optimum intervention on cognitive outcome in AD difficult to make (Farina et al., 2014). Studies are required to understand the frequency, intensity, duration, and types of exercise that best enhance cognitive functions in older adults; (Bherer et al., 2013) and to determine the effects of different exercise types on cognition in older adults with MCI, as it is likely that different exercise types are more effective in certain individuals (Farina et al., 2014).

BAILAMOS[®] is an innovative, culturally appropriate dance program that has been developed by Dr. Marquez and an accomplished Latin dance instructor. Evidence from a pilot trial and

small randomized controlled trial provide preliminary support for the impact of BAILAMOS[®] on PA and cognitive functioning among older Latinos at risk for disability. However, to date no studies have examined the feasibility and impact of dance in older adults or Latinos who already have MCI. Thus, we propose a pilot trial to test the feasibility and impact of the BAILAMOS[®] program in older Latinos with MCI.

Specific Aim 1: Feasibility - To determine the feasibility of implementing BAILAMOS[®] in older Latinos with mild cognitive impairment.

Hypothesis 1: Program feasibility will be evidenced by a 75% reach ((participants enrolled/participants screened and eligible) x 100), 80% retention ((participants completing post-testing/participants enrolled) x100) and weekly attendance rate. Post-intervention focus groups will reflect strong program satisfaction.

Specific Aim 2: Impact- To determine the impact of BAILAMOS[®] in older Latinos with cognitive impairment on physical activity, cardiorespiratory fitness, and sedentary time.

Hypothesis 2: The intervention will yield small-medium effect sizes reflecting improvements on measures of physical activity (accelerometer-assessed PA) and cardiorespiratory fitness. The intervention will also reduce total waking sedentary time determined by the summation of the duration of all sitting/lying bouts (activPAL–assessed sedentary time).

Specific Aim 3: Impact – To determine the impact of BAILAMOS[®] in older Latinos with mild cognitive impairment on cognitive function, physical function, quality of life and depression.

Hypothesis 3: The intervention will yield small-medium effect sizes reflecting improvements on measures of cognition (i.e., working memory, verbal fluency, processing speed, executive function, and episodic memory), physical function (Short Physical Performance Battery and Timed Up-and-Go), quality of life (QOL-AD), and depression (GDS-15).

II. LITERATURE REVIEW

A. Aging

Advances in health and technology have led to increased life expectancy of populations across the world. Along with the rest of the world, the United States (U.S.) is an aging society. By 2050, the older population aged 65 and over is projected to be 83.7 million (Ortman et al., 2014). The demographic changes that the U.S. will encounter will have vast implications on the economy, policies, families, and businesses. These changes are galvanizing policy makers, clinicians, and researchers to be more prepared to care for our aging population. With an increase in life expectancy comes an increased likelihood of the onset of chronic diseases. Older adults have the highest prevalence of multiple chronic conditions of which 77% of older adults have at least two ((NCOA), 2014). Despite an increase in life expectancy, there is considerable evidence that morbidity can be further reduced and health enhanced during our now longer lives (Prohaska et al., 2012). This reduction and health enhancement can be brought about by identifying and implementing effective disease prevention efforts.

B. Health Inequities among Latinos

Latinos include any person of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish culture or origin, regardless of race ((OMH), 2015). Latinos represent approximately 16.9% of the U.S. population and by 2050 one-third of the U.S. population will be comprised of Latinos ((OMH), 2015). The older Latino population was 3.6 million in 2014 and is projected to grow to 21.5 million by 2060 ((AoA), 2015). With these changes, Latinos will bear an increased share of the economic and social burden associated with diseases that affect older adults (Manly and Mayeux, 2004).

When assessing Latinos' health, it is important to take into consideration that Latinos represent diverse cultures, generational status, backgrounds, and exposures (Daviglius et al., 2014). A recent, landmark epidemiological study examining the prevalence of major cardiovascular disease (CVD) risk factors among Latinos of different subgroups found that participants of Puerto Rican background, lower socioeconomic status, and higher levels of acculturation had a higher prevalence of CVD risk profiles (Daviglius et al., 2014). Therefore, Latinos' diverse backgrounds influence their health status.

Although CVD risk factors and disease rates may vary considerably among Latino subgroups, significant health inequities exist within the Latino population at large. Health inequities are differences in health that are preventable, avoidable, and unjust. Health inequities are due to our historical legacy; in which history has created unequal gaps in education and health; therefore, people have different starting points (Lee and Cubbin, 2009).

Despite the significant socioeconomic and psychosocial disadvantages that Latinos experience, Latinos in the U.S. have a life expectancy of approximately 81.6 years ((CDC), 2015) which is greater than that of non-Latinos whites. This phenomenon is known as the Hispanic Paradox. Although there are several possible explanations for this phenomenon, improving Latinos' quality of life remains a challenge.

Latinos have a greater risk of developing chronic conditions involving lifestyle factors such as heart disease, high blood pressure, and diabetes when compared to non-Latino whites (August & Sorkin, 2011). Presence of these chronic diseases, compounded with poverty and low education levels, may increase the risk of cognitive decline and risk of dementia for this population (Association, 2004). Older Latinos experience Alzheimer's disease (AD) symptoms 6.8 years earlier (Clark et al., 2005) and are 1.5 times more likely to have AD than non-Latino

whites (Haan et al., 2003). Disparities also occur for several health behaviors. For example, Latinos aged 65-74 are 46% less likely to engage in leisure time physical activity than older non-Latino whites (Marquez et al., 2010).

Latinos' poor health is shaped by complex factors such as language and cultural barriers, lack of access to preventative care, financial and time constraints, lack of health insurance, unemployment, living in disadvantaged neighborhoods, and social, economic, and environmental inequity relative to others (Prohaska et al., 2012). Latinos' social determinants of health impact their health outcomes which will either place them in advantaged or disadvantaged situations which ultimately contribute to health inequities. When studying and creating interventions for Latinos it is important to consider and understand the individual, social and physical environment, policy level factors, and the social determinants of health in order to address the health inequities that exist.

C. Mild Cognitive Impairment/ Alzheimer's disease

Aging is associated with an increased risk for cognitive decline, and it can be characterized as mild cognitive impairment (MCI) or dementia depending on severity. MCI is a term used to describe a state where there is a cognitive decline but it is not severe enough to meet the diagnostic criteria for dementia (Petersen et al., 2001). Persons with MCI may have more difficulty performing complex functional tasks, such as paying bills and preparing a meal; however they are generally able to maintain their activities of daily living (Albert et al., 2011). Studies have found that people with MCI have atrophy of the hippocampus which is important for learning and memory (Wolf et al., 2004). Major population-based studies have determined that the average prevalence of MCI is 18.9% (Petersen et al., 2014). Furthermore, individuals with MCI have a conversion rate to Alzheimer's (AD) disease of ~15% per year (Davatzikos et

al., 2011). Evidence indicates that pharmacotherapeutic interventions in individuals with MCI have had little/no significant benefit in delaying the progression to AD (Tampi, 2015).

Identifying MCI at an early stage and finding alternative effective treatments that may stop or delay the progression to AD is of extreme importance.

AD is not part of normal aging; it is a progressive disease in which symptoms develop and worsen over time. It affects a person's memory, thinking, and behavior. An estimated 5.2 million older adults 65 years and older are living with AD in the United States (U.S) (Association, 2016). By 2050, this number is projected to increase to 13.8 million (Association, 2016). AD has a devastating toll on the individual, families, communities, and economy. In 2016, AD and other dementias will cost the U.S. \$239 billion (Association, 2016). Currently, there is no cure for AD, however evidence suggests that modifications or therapies, such as aerobic exercise, may be effective at reducing the rate of progression from MCI to AD (Lautenschlager et al., 2008b).

AD is also a disease that greatly impacts Latinos. By 2050, AD and related dementias could increase more than six-fold, from ~200,000 in 2004 to ~1.3 million (Association, 2004). Studies have revealed that Latinos in the U.S. are 1.5 times more likely to develop AD than non-Latino whites and are less likely to have a diagnosis of their condition (Haan et al., 2003). Factors that contribute to this disparity include low education levels, high poverty levels, and presence of vascular disease risk factors (Association, 2004). Furthermore, despite the implementation of the 1993 Revitalization Act, which mandates studies to include racial/ethnic populations in research studies, there continues to be very few studies conducted among older Latinos with MCI/AD. Thus there is a need for more research amongst this vulnerable population in order to increase our understanding of the causes of these conditions.

D. Physical Activity and Sedentary Behavior among Older Adults

There is a vast amount and irrefutable evidence that regular physical activity (PA) improves chronic diseases and is linked to lower-all cause mortality (Warburton et al., 2006). Acute bouts of PA have been shown to reduce state anxiety immediately following exercise performance (McAuley, Mihalko, & Bane, 1997). Furthermore, increasing PA has been shown to reduce the risk of disability (Keysor, 2003) and improve quality of life among older adults. For older adults, it may be more important to maintain functional and cognitive abilities and quality of life rather than with aspects of physical fitness (Pollock, Graves, Swart, & Lowenthal, 1994).

Numerous studies have found that physical activity (PA) can improve cognition among healthy older adults (2009, Colcombe et al., 2003a). For example in a meta-analysis by Colcombe, participation in an aerobic program or combined (aerobic & strength) among healthy, sedentary older adults showed significant positive effects on executive control, control processing, visuospatial, and speed (Colcombe and Kramer, 2003). Tseng and colleagues also found that multi-component PA interventions improved cognition in healthy older adults (Tseng et al., 2011). Although positive associations with PA and cognition are evident, it is difficult to distinguish which types of PA have the most impact on cognition because there is so much variability in type, frequency, duration, and intensity of the intervention (Angevaren et al., 2008, Tseng et al., 2011). Also, there is great variability in the type of cognitive measures that are used to test PA impact on cognition. Many studies use the Mini Mental State Examination (MMSE) which can be great due to ease of administration and comparability among other studies; however, because the MMSE is a measure of global cognition, it does not provide information about changes in cognitive subdomains (Tseng et al., 2011, Angevaren et al., 2008). Therefore, it is difficult to determine the impact that PA has on cognitive subdomains.

Most PA interventions targeting older adults have excluded individuals with MCI either through explicit criteria or because such individuals are thought to have poor memory or are unable to complete the programs or assessments (Logsdon et al., 2009). Research that has examined the impact of PA among people with MCI and AD is limited. In a meta-analysis by Heyn and colleagues, they found a moderate-large effect size for the effect of exercise on fitness, cognition (measured by MMSE), function, and behavior among older adults with cognitive impairment and dementia (Heyn et al., 2004a). Strength-training programs showed a large effect for improving short term memory (Heyn et al., 2004a). A randomized controlled study among nursing home residents with AD found that participants in the exercise intervention declined less than the control group on the outcome of activities of daily living (Rolland et al., 2007). Although this study did not examine cognition, physical function is associated with cognitive function; therefore, if physical function decline can be attenuated, then cognitive function may also improve.

In addition to interventions examining the effect of PA on cognitively impaired older adults, studies are also needed to examine the impact of sedentary behavior (SB) on cognitive outcomes, given that SBs account for 50% of waking hours (Voss, 2014). Most studies have examined the metabolic effects associated with SB, which are known to affect cognition; unfortunately very few have examined the direct impact of SB on cognition (Voss, 2014). A cross-sectional study that examined the health effects of SBs in healthy older adults found a negative association between TV viewing and executive functioning (Kesse-Guyot et al., 2012). Hamer et al. conducted a prospective study among a cohort of community dwelling older adults and found that TV viewing time was associated with higher depressive symptoms and worse global cognitive function (Hamer and Stamatakis, 2014). Another study that examined the

association of breaks in sedentary time with biological markers of metabolic risk found that more interruptions were beneficially associated with metabolic markers such as waist circumference, body mass index (BMI), triglycerides, and 2-hr plasma glucose (Healy et al., 2008). Given the evidence that SB and PA both affect metabolic function, it is possible they have overlapping pathways and interact in their effect on cognitive function (Voss, 2014). Current evidence supports that reductions and breaks in sedentary time can be produced in PA interventions that include a degree of focus on reducing sedentary behavior (Prince et al., 2014b). Studies that integrate objective and subjective measurements of both SB and PA with cognitive measures among healthy and cognitively impaired older adults are needed in order to expand the evidence (Prince et al., 2014b).

Despite the known benefits of PA and the detrimental effects of SBs, Latinos aged 55-64 are 50% less likely to engage in leisure time PA (LTPA) than older non-Latino whites of comparable age, and Latinos 65-74 are 46% less likely (Marquez, Neighbors, & Bustamante, 2010). Furthermore, many older Latinos do not have a history of engaging in traditional exercise (Cromwell & Berg, 2006). Along with low levels of PA, older Latinos spend an average of 11.11 hours/day in sedentary behaviors (Merchant et al., 2015). To date, there has been a dearth of culturally appropriate PA interventions designed for older Latinos and even fewer for older Latinos with MCI/AD. Interventions that concomitantly improve PA and reduce SB among older Latinos have yet to be conducted by researchers. Therefore, there is a need to develop PA and SB interventions that target older Latinos with MCI/AD. PA and SB interventions that target this population should be culturally tailored and relevant because cultural factors may help with the acceptance and adoption of health promotion programs and messages. Furthermore, studies have shown that when designing culturally appropriate PA interventions, an emphasis should be

placed on social support (Ickes and Sharma, 2012). This can be implemented via group-based PA interventions and including health discussion sessions in which participants share information.

E. Dance as Physical Activity

Three lifestyle factors can play a significant role in slowing the rate of cognitive decline: a socially integrated network, cognitive leisure activity, and regular PA, in which PA has the most support against cognitive decline (Fratiglioni et al., 2004). Dance is a type of PA that incorporates these three lifestyle factors. Dancing is typically done in a group setting or with a partner, learning new steps and routines serves a cognitive activity, and many styles of dance serve as moderate intensity aerobic activity.

For older Latinos, designing interventions that incorporate dance is considered culturally relevant. Dance is an important form of socialization, entertainment, and leisure in Latin American cultures (Delgado and Munoz, 1997, Lewis, 1994). Older Latinos are known to prefer music, singing, and dance as ways to remain physically active (Belza et al., 2004). The few studies that have examined the effects of dance on the health of older adults indicate that older adults who dance on a regular basis have greater flexibility, postural stability, balance, physical reaction time, and cognitive performance than older adults who do not dance (Kattenstroth et al., 2013). Dance also requires individuals to observe, plan, monitor, and execute dance sequences and turns, which may increase activity of the premotor cortex and impact brain plasticity; (Karpati et al., 2015) thus making it a top option for preventing cognitive decline. Moreover, studies show that dance interventions may address older adults' barriers to being physically active such as cultural preferences, pre-existing medical conditions, and physical limitations (Hwang and Braun, 2015). Older Latinos also find dancing enjoyable (Judge, 2003, Marquez et al., 2015) which might lead to increased PA maintenance (Robinson et al., 2003).

III. Feasibility of a Latin Dance Program for Older Latinos with Mild Cognitive Impairment

Susan Aguiñaga, MS and David X. Marquez, PhD

A. Abstract

Older Latinos are disproportionately affected by chronic diseases and are at higher risk of developing mild cognitive impairment (MCI) compared to non-Latino whites. Physical activity (PA) has been shown to improve cognitive function and improve chronic diseases among older adults. Unfortunately, most PA interventions targeting older adults exclude individuals with MCI, and there are even fewer PA interventions targeting underserved populations with MCI. Thus, the purpose of this study was to conduct a pilot, randomized controlled study to investigate the feasibility and safety of a Latin dance program in older Latinos with MCI. Spanish-speaking older Latinos [N=21, 75.4 ± 6.3 years old, 76.2% female, 22.4± 2.8 MMSE score], were randomized into a 16 week, twice-weekly dance intervention or to a wait-list control group; the wait-list control group crossed over at week 17 and received the dance intervention. Feasibility was determined by assessing reach, retention, adherence, dance logs, dance evaluations, and focus groups post-intervention. Reach was 91.3% of people who were screened and eligible. Program retention was 95.2%. The dropout rate was 42.8% (n = 9). The intervention attendance for all participants was 55.76 %; not including dropouts, attendance was 85%. Data from the dance logs indicated that participants' feelings pre-dance, during, and post-dance ranged from 2.90-4.96. Participants' reported a mean RPE of 'somewhat light' (M=10.94, SD=.51, range 10.08-12.29) and enjoyment of the dance sessions (M=6.25, SD=.23, range 5.70-6.92). Dance evaluations indicate that participants' energy and focus was rated as having 'some energy and focus' (M=2.55, SD=.20, range 2.00-2.90), and their dance ability was rated as 'somewhat able to do the steps' (M=2.42, SD=.29, range 2.00-2.94). The focus group data revealed that they had

a high enthusiasm for dance, and they enjoyed learning new dance styles and techniques. In conclusion, results from this study demonstrate that older Latinos with MCI find Latin dance as an appealing, enjoyable, and safe mode of PA. Future dance studies should involve a larger randomized controlled trial and should continue to include underserved populations. Funded by the UIC Department of Kinesiology and Nutrition and the Rush Alzheimer's Disease Center.

Key Words- older Latinos, physical activity, dance, minorities, cognitive impairment

B. Introduction

Older Latinos account for 3.6 percent of the older adult population in the United States and are projected to account for 21.5 percent of the older adult population by 2060 ((AoA), 2015). Older Latinos are disproportionately affected by chronic diseases such as diabetes and obesity compared to non-Latino whites (Dominguez, 2015). Presence of these chronic diseases, compounded with poverty and low education levels, may increase the risk of cognitive decline and risk of dementia for this population (Association, 2004). Older Latinos experience Alzheimer's disease (AD) symptoms 6.8 years earlier (Clark et al., 2005) and are 1.5 times more likely to have AD than non-Latino whites (Haan et al., 2003). AD is often preceded by mild cognitive impairment (MCI), a term used to describe a state in which a person has cognitive decline, but it is not severe enough to meet the diagnostic criteria for dementia, nor does it impact everyday activities (Petersen et al., 1999). A study involving a large population-based cohort of ethnically, linguistically, and educationally diverse older adults found that those who self-identified as Latino, had low education levels, and had a history of diabetes were at higher risk of developing MCI compared to non-Latino whites (Manly et al., 2008). Interventions that slow cognitive decline among persons with MCI are critical in order to prevent or delay conversion to AD (Manly et al., 2008). Evidence indicates that pharmacotherapeutic

interventions in individuals with MCI have had little/no significant benefit in delaying the progression to AD (Tampi, 2015); however, physical activity (PA) has been shown to improve cognitive function in older adults with MCI (Lautenschlager et al., 2008a).

Numerous studies have found that PA can improve chronic diseases and cognition (2009, Colcombe et al., 2003a). Unfortunately, Latinos aged 65-74 are 46% less likely to engage in leisure time PA than older non-Latino whites (Marquez et al., 2010). Older Latinos participate in an average of 11 minutes of leisure-time PA per day, (U.S. Department of Health and Human Services; National Institutes of Health; National Heart, 2013) but the recommendation is 30 minutes of moderate-intensity aerobic activity at least 5 days per week to obtain health benefits. Older Latinos understand the physical and psychological benefits of exercise (Melillo et al., 2001). However, this understanding has not led to the adoption and maintenance of PA.

Interventions that target older Latinos with MCI should use culturally appropriate forms of PA (Cromwell and Berg, 2006b). Older Latinos are known to prefer music, singing, and dance as ways to remain physically active (Belza et al., 2004). Dance has been an important form of socialization, entertainment, and leisure in Latin American cultures (Delgado and Munoz, 1997, Lewis, 1994). The few studies that have examined the effects of dance on the health of older adults indicate that older adults who dance on a regular basis have greater flexibility, postural stability, balance, physical reaction time, and cognitive performance than older adults who do not dance (Kattenstroth et al., 2013). Dance also requires individuals to observe, plan, monitor, and execute dance sequences and turns, which may increase activity of the premotor cortex and impact brain plasticity; (Karpati et al., 2015) thus making it a top option for preventing cognitive decline. Moreover, studies show that dance interventions may address older adults' barriers to being physically active such as cultural preferences, pre-existing medical

conditions, and physical limitations (Woei, Ni Hwang, 2015). Older Latinos also find dancing enjoyable (Judge, 2003, Marquez et al., 2015) which might lead to increased PA maintenance (Robinson et al., 2003).

To date, most PA interventions targeting older adults have excluded individuals with MCI either through explicit criteria or because such individuals are thought to have poor memory or are unable to complete the programs or assessments ((Logsdon et al., 2009). Furthermore, older, underserved populations with MCI are even more grossly under-represented in the literature despite the literature providing evidence that these populations have the greatest need for interventions. Given these considerations, the aim of this pilot randomized controlled study was to investigate the feasibility and safety of a Latin dance program in community-dwelling older Latinos with MCI. We hypothesized that program feasibility would be evidenced by a 75% reach, 80% retention, and adequate weekly attendance. We also hypothesized that the post-intervention focus groups would reflect strong program satisfaction.

C. Methods

Sample. Older Latinos were recruited via study flyers and announcements at an Adult Wellness Center (AWC) in Chicago to participate in a 16-week Latin dance program. The AWC is an adult day service center which offers bilingual and bicultural services to the Spanish-speaking older adult population of Chicago and provides many supervised, structured activities that maintain, improve, and restore participants' abilities. In order to attend the AWC, individuals must meet certain eligibility criteria, including > 60 years old, U.S. citizen, Illinois resident, physician authorization, and a score of 29 or higher on the Determination Need Assessment (DON). Inclusion criteria for the study were the following: (a) age \geq 60 years old, (b) self-identification as Latino/Hispanic, (c) ability to speak or understand Spanish (d) MCI with scores

of 18-26 (Logsdon et al., 2010) (McGough et al., 2011) as measured by the Mini Mental State Examination (Folstein et al., 1975), and (e) no plans to leave the country for more than two consecutive weeks over the next four months (study duration). Exclusion criteria included: (a) regular use of assistance to walk (e.g., cane), (b) stroke at any time, (c) >150 minutes of self-reported exercise defined as structured, planned, and repetitive aerobic activity like walking or swimming over an extended period of time with a specific objective such as increasing fitness, physical performance, or health (Bouchard et al., 1994). Additionally, participants who passed initial screening were asked to get medical clearance in order to participate in the research. Study approval was obtained from the University of Illinois at Chicago Institutional Review Board.

Design. The study was a pilot randomized controlled trial, with a wait-list control and crossover at 17 weeks. Participants who met inclusion criteria and completed baseline testing were randomized to either the dance program or the wait-list condition. Randomization was done by computer-generated random numbers and was delivered by a research staff member. The wait-list control group was asked to maintain their usual activities during weeks 1 through 16. At week 17, after the post-intervention testing, the wait-list group crossed over and received the 16-week dance program, at which time the intervention group continued their usual activities. Both programs were led by the same professional dance instructor and participated in the same dance program.

Testing. All testing took place at the AWC. This was preferred because participants already attended the AWC, and the space necessary for testing was available. At the testing a bilingual research staff member, blinded to study condition, explained the study and read the Informed Consent to the participant. After participants agreed to participate, they signed the Informed Consent. Consent of participants on their own was deemed appropriate, since they had MCI, not

dementia. Questionnaires and assessments were then administered, and all measures were available in Spanish or English. Participants were also given an ActiGraph accelerometer and ActivPal monitor to wear for one week. Testing occurred at Baseline, 2-months, 4-months, 6-months, and 8-months, to see if there were intermediate changes over time. For all time points questionnaires and tests were administered in the same order as baseline testing. Participants were compensated with \$15 dollars for completion of the questionnaires, and another \$15 dollars for returning their accelerometer and ActivPal monitors.

Intervention. BAILAMOS[®] includes a 4-month, twice-weekly program. Every dance session is one hour in length. Also, monthly discussion sessions were held. Readers can see a previous publication for a detailed description of the program (Marquez et al., 2014). For the current intervention, a research staff member was present at all dance sessions to set up the room and observe the class. Participants wore an orange Velcro bracelet on their right wrist and a green Velcro bracelet on their left wrist in order to help them distinguish between moves to the left and right. We followed the BAILAMOS[®] manual, but were cognizant of elements that seemed to confuse participants. We recorded such challenges, and revised the program as needed. For example, if some of the dance turns that are part of BAILAMOS[®] were too confusing, we revised the moves in ways that still challenged participants physically and cognitively, but did not overwhelm them or put their safety at risk. The monthly discussion sessions were also modified from the original versions to include information about sedentary behavior and the benefits of reducing sedentary time and adding sit-to-stand transitions. During the first discussion session, we provided the participants with visual ActivPAL feedback in which they were shown an output page of their baseline ActivPAL data and asked to reduce the yellow

(represents sedentary time) and increase green (represents standing) and red (represents stepping).

Measures

Background Measures. Demographic, health history, and acculturation questionnaires ((Ellison et al., 2011) were administered at baseline testing by a bilingual research staff member. Height, weight, blood pressure, and waist circumference was also assessed.

Reach. Reach was calculated as $[(\text{participants enrolled}/\text{participants screened and eligible}) \times 100]$ (Gardiner et al., 2011).

Retention. Retention was calculated as $[(\text{participants completing post-testing}/\text{participants enrolled}) \times 100]$ (Gardiner et al., 2011).

Intervention Attendance. Attendance at each session was recorded. Adherence was calculated as $[(\text{number of dance sessions attended}/\text{total number of dance sessions}) \times 100]$. Dropouts were those participants who stopped coming to the program and did not come back. Adherence was calculated with and without dropouts.

Dance Logs. At the end of every dance session participants filled out logs with five questions. Participants, with assistance from staff if needed, recorded the number of minutes danced that was announced by the instructor, and completed the Feeling Scale from -5 (very bad) to +5 (very good) to reflect how they were feeling before, during, and after class (Hardy and Rejeski, 1989). Participants also recorded ratings of perceived exertion using the Borg Rating of Perceived Exertion Scale with a 15-item scale from 6 (no exertion at all) to 20 (maximum exertion) (Borg, 1998). Finally, the participants recorded enjoyment of the dance session on a 7-point Likert scale from 1 (not at all) to 7 (very much).

Dance Log Completeness. Dance logs were assessed for rate of completeness. Rate of completeness was calculated as $[(\text{log answers completed}/\text{log answers possible}) \times 100]$.

Dance Evaluations. After every dance session the dance instructor assessed the participants' energy and focus using a 3-point scale and also assessed participants' ability to perform the steps using a 3-point scale.

Focus Groups. Focus groups were conducted after each group completed the dance program. All participants were invited to the focus group regardless of attendance rate. The focus groups had a duration of 40-60 minutes. A focus group guide (Appendix B) was used to examine participants' perceptions and attitudes of memory loss (Wilcox et al., 2009), dance (Marquez et al., 2015), and the BAILAMOS[®] dance program. Focus groups were audio-recorded, transcribed verbatim in Spanish, and translated to English. We used a directed content analysis (Hsieh and Shannon, 2005) which is an analysis that starts with relevant research findings as guidance for initial codes.

Statistical Analysis

All analysis were conducted in SPSS (Version 22, IBM Corporation, Chicago, IL). Baseline characteristics of the study were analyzed using independent *t* tests for continuous variables and a χ^2 test for categorical variables. Descriptive statistics were conducted for the logs and evaluations. Class by class means and standard deviations were calculated. Because the control group received the dance intervention at week 17, the cross-over design allowed us to combine the attendance, logs, and evaluation data for the dance intervention and the wait list control group, thus the results presented are combined data. Attendance rate was calculated with and without dropouts.

D. Results

Participant characteristics

Thirty-three persons expressed interest in the study. Among them, 10 were excluded due to: MMSE <18 (n=3), MMSE > 26 (n=1), lost interest (n=2), >150 min of exercise (n=2), died (n=1), and too cognitively impaired to screen (n=1). A total of 23 persons were found eligible to participate in the study, but not all enrolled in the study. Reasons for not enrolling were that their physician declined approval (n=1) and declined to participate (n=1). Thus, a total of 21 participants enrolled in the study (Figure 1). Participants' baseline characteristics are presented in Table 1. Participants in the dance group had a higher percentage of widows than the control (60% vs 18.2%, $p = .022$), the control group had a higher BMI than the dance group, (26.3 vs 29.0, $p = .001$), and the dance group self-reported having more cancer (40% vs 0, $p = .02$).

Reach, retention, and attendance

Reach was 91.3% of people who were screened and eligible. Program retention was 95.2%. The dropout rate was 42.8% (n = 9). The most frequent reasons for dropout from the dance program were health-related problems (e.g. back and knee pain). The intervention adherence for all participants including dropouts was 55.76 %. Not including the dropouts, the intervention adherence was 85%. The average attendance for all participants including dropouts was 17.81 sessions (of 32 total). The average attendance excluding dropouts was 27.17 sessions. Only 9 participants attended more than 75% of the dance sessions. Three prompt reports were submitted to IRB, but none were deemed as adverse. Two participants fell outside of the program and one participant fell during class, but did not suffer any injuries. The AWC had nurses on staff who assessed the participant for any injuries.

Dance logs

Participants reported feeling ‘very good’ ($M=3.74$, $SD=.29$) before the dance class started, feeling ‘very good’ ($M=3.76$, $SD=.36$) during the dance class, and feeling ‘very good’ ($M=3.76$, $SD=.32$) after the dance class ended. On average participants’ feelings pre-dance, during, and post-dance ranged from 2.90-4.96 (Figure 2). Participants’ reported a mean RPE of ‘light’ ($M=10.94$, $SD=.51$, range 10.08-12.29) (Figure 3). This RPE corresponds with light-moderate intensity (Borg, 1998). Participants’ also reported enjoyment of the dance sessions ($M=6.25$, $SD=.23$, range 5.70-6.92) (Figure 4). Dance logs had a completion rate of 99% complete.

Dance evaluations

On average the participants’ energy and focus was rated as having ‘some energy and focus’ ($M=2.55$, $SD=.20$, range 2.00-2.90). Participants’ dance ability was rated as ‘somewhat able to do the steps’ ($M=2.42$, $SD=.29$, range 2.00-2.94).

Focus groups

Seven participants from the dance group and 6 participants from the control group (after completion of the dance program) participated in focus groups. A total of 4 themes emerged from the focus groups.

Enthusiasm for dance. Participants talked about their enjoyment of dance. They said it was a great form of exercise because it was a total body exercise (“Because you are exercising your brain, body, arms, legs; your whole body”). They also mentioned that dancing left them with more energy, without pain and discomfort, and happiness (“And wherever there is dance there is happiness”); they did not find a need to rest after dancing (“Dancing for exercise doesn’t get you tired for anything”). Participants also referred to dance as a mindful activity” (“It’s good because one has to be mindful of the music, the footing. It puts the hearing and also the physical to use,

right. Because you're doing an exercise. Mentally, physically, one is doing—practicing everything is right. Thus, you put your whole body and mind into the activity. It gets you activate and it's something very positive.”)

Positive aspects of the BAILAMOS© program. Participants liked that the program took place after lunch (“One has to do a little exercise so that the food goes and digests. And, thus, the dance has helped us”), and found the space, amount of participants, and the dance styles in the class appropriate. They thought that the instructor was knowledgeable and provided proper techniques (“And we come to learn... we know how to dance in our own way but to learn, and, well, it's him that's teaching the steps and we have to follow him”). Participants also praised the instructor's patience (“Ah, beautiful person; very active and that sticks with you; very caring and we liked how he taught us and everything, with a lot of patience...”)

Unfavorable aspects of the BAILAMOS© program. Participants did not like that the instructor would turn off the music to show participants the dance moves (“Yes and they take away the music, they take it. And they make us do the exercises without the music; at the very least, I don't like that”). Some participants mentioned that they would not do this program again because they prefer freestyle dancing (“And when I dance outside of class, I dance how I want, I have more fun... here I have to be tethered down to the teacher”). Participants also talked about playing more of a variety of music (“Uhm, notice that the music was good, but, for me, it'd be better that you changed it—to not always put the same CD”).

Physical well-being after dance sessions. Some participants reported having more energy after the dance sessions took place (“With more energy, one doesn't finish tired for anything. Dancing for exercise doesn't get you tired for anything...”). Others reported feeling tired after the class and other attributed their tiredness to aging. Some participants reported feeling tired prior to

starting the dance sessions because they had participated in other activities before class started (“It’s that here, a lot of times, the days before the class they put on music in a salon or outside and there one dances, dances, and dances. And, later, when you go the class, well, you were already a little tired because you went dancing earlier”).

E. Discussion

The goal of this pilot trial was to determine the feasibility and safety of a Latin dance program for older Latinos with MCI. Participants in this study reported enjoying the program ‘very much’ and feeling ‘very good’ before, during, and after most dance sessions, and deemed the dance styles as a light-moderate intensity activity. Furthermore, the focus group data revealed that they had a high enthusiasm for dance, and they enjoyed learning new dance styles and techniques. The participants in the study were also able to fill out logs with a high completion rate. These results suggest the feasibility of implementing a Latin dance program in older Latinos with MCI who attend an AWC.

Our intervention was shown to have modest attendance (55.76 %). Not including the dropouts, the intervention attendance was 85%. Other exercise interventions conducted among older adults with MCI have shown varied attendance rates. A year-long walking program among older adults with MCI had a similar attendance (63%) to our intervention (van Uffelen et al., 2008), whereas a recent 12-week dumbbell training program had an 86% attendance rate (Lu et al., 2016b), and a 9-week endurance, strength, and balance exercise program had a 90% adherence rate (Logsdon et al., 2009). Differences in attendance may be due to variation in time period of the interventions and difference in severity of cognitive impairment. Individuals that attend adult day service centers such as the AWC are more impaired in which 65% have moderate to severe dementia (Division of Planning, 2004). Participants in this study had a mean

MMSE score of 22.4, whereas participants in the other studies had a MMSE score greater than 26. Although it was a small sample, the participants in this study represent a population at high risk of cognitive decline. Our participants self-reported multiple comorbidities (mean of 5.3), low income, and low education levels; all of which have been shown to contribute to poor intervention attendance.

The main reasons for dropping out of the program were due to health-related issues. Participants reported experiencing upper and lower extremity and back pain ($n=5$), and one hip fracture ($n=1$). The pain experienced by the participants was pain that was already experienced by several of the participants prior to enrolling into the dance intervention. Some participants mentioned that the dancing ameliorated their pain; however most thought that it exacerbated their pain. Although not statistically different, the dropouts did report more comorbidities ($M=6.11$, $SD=3.06$) than those who frequently attended the program ($M=4.67$, $SD=3.77$). Participants dropped from the program between a range of sessions (3-14). Other reasons participants dropped from the program were schedule conflicts, one participant thought the dance sessions were too difficult, and another participant was out of the country.

Due to a high number of people dropping from the program due to pain, researchers considering working with this population may consider screening people out who experience certain levels of pain or individuals who have had history of experiencing pain. Also, depending on the source of their pain, certain dance styles may not be appropriate for some participants due to the speed of the music. For example, most participants dropped during or immediately after the first dance style (merengue). Although merengue is the easiest of the four dance styles in the BAILAMOS© program, it is also the fastest. The movements required to dance merengue are also very repetitive. The fast music along with repetitive movements may have exacerbated

participants' pain, thus causing participants to drop from the program. Future studies may want to assess whether participants can tolerate fast dancing for 1 hour in length. Otherwise, they may consider shortening the time of the classes or removing it completely for certain populations.

Despite modest attendance, most participants were still willing to complete testing at all testing points; data was available for 94.3% of the participants. We speculate that this was due to the strong rapport we developed with the participants and AWC staff, and we minimized participant burden by conducting all testing at the AWC. Furthermore, all testing and dance sessions were conducted in Spanish. Pekmezi and colleagues also found that their participants responded favorably when receiving the intervention and information in Spanish (Pekmezi et al., 2009).

Throughout the dance intervention, we were able to adapt the BAILAMOS© manual to make the program safer for participants. For example, the instructor and the PI removed the fast turns from all of the dance styles due to the moves involving speedy foot rotations which could increase risk of falls. Dance moves were simplified and involved more repetition since participants were having a difficult time recalling different moves. The instructor also used an application on his cellular phone to slow down the music. As the dance sessions progressed and participants mastered the steps, the instructor would gradually increase the speed of the music. Also, if participants complained about upper extremity pain, the instructor would modify the movement and ensure that all participants were aware of how to dance with that particular participant who was experiencing pain. Frequent breaks were also taken, and if participants experienced any type of discomfort, the instructor would encourage them to take a seat and join whenever they were ready.

While working with this population, we encountered several challenges that should be considered when designing future interventions persons with MCI. First, the purpose of the research assistant attending all dance sessions was initially to set up the room and observe the sessions. However, many participants needed daily reminders from the RA that class was occurring that day and if the dance instructor had not yet arrived, the participants would grow impatient, leave the room, and come back once he arrived, or not come back. Another challenge we experienced was competing activities at the AWC. Other activities, such as bingo, dominoes tournaments, center parties and special events frequently competed with participation in the dance intervention. When implementing future interventions with older Latinos with MCI, personnel reminding participants of the importance of attending the exercise program may be needed, and implementing the program during a time where it does not compete with other activities should also be considered, if possible.

Strengths of this study include the focus on older Latinos with MCI, persons who speak Spanish, a culturally appropriate physical activity intervention, and use of mixed-methodology to assess feasibility. The limitations of this study were the small sample size and high dropout rate. Also, given the low MMSE score cutoff for inclusion in the study, it cannot be ruled out that participants may have already had dementia.

In conclusion, results from this feasibility study demonstrate that older Latinos with MCI find Latin dance as an appealing, enjoyable, and safe mode of PA. Our results, however, should be interpreted with caution as this study was conducted in a highly controlled environment (AWC) with nurses on staff. Researchers who want to create interventions for community dwelling older Latinos with MCI who do not have access to resources/services such as the AWC are recommended to conduct another feasibility study that is tailored to meet their needs. If such

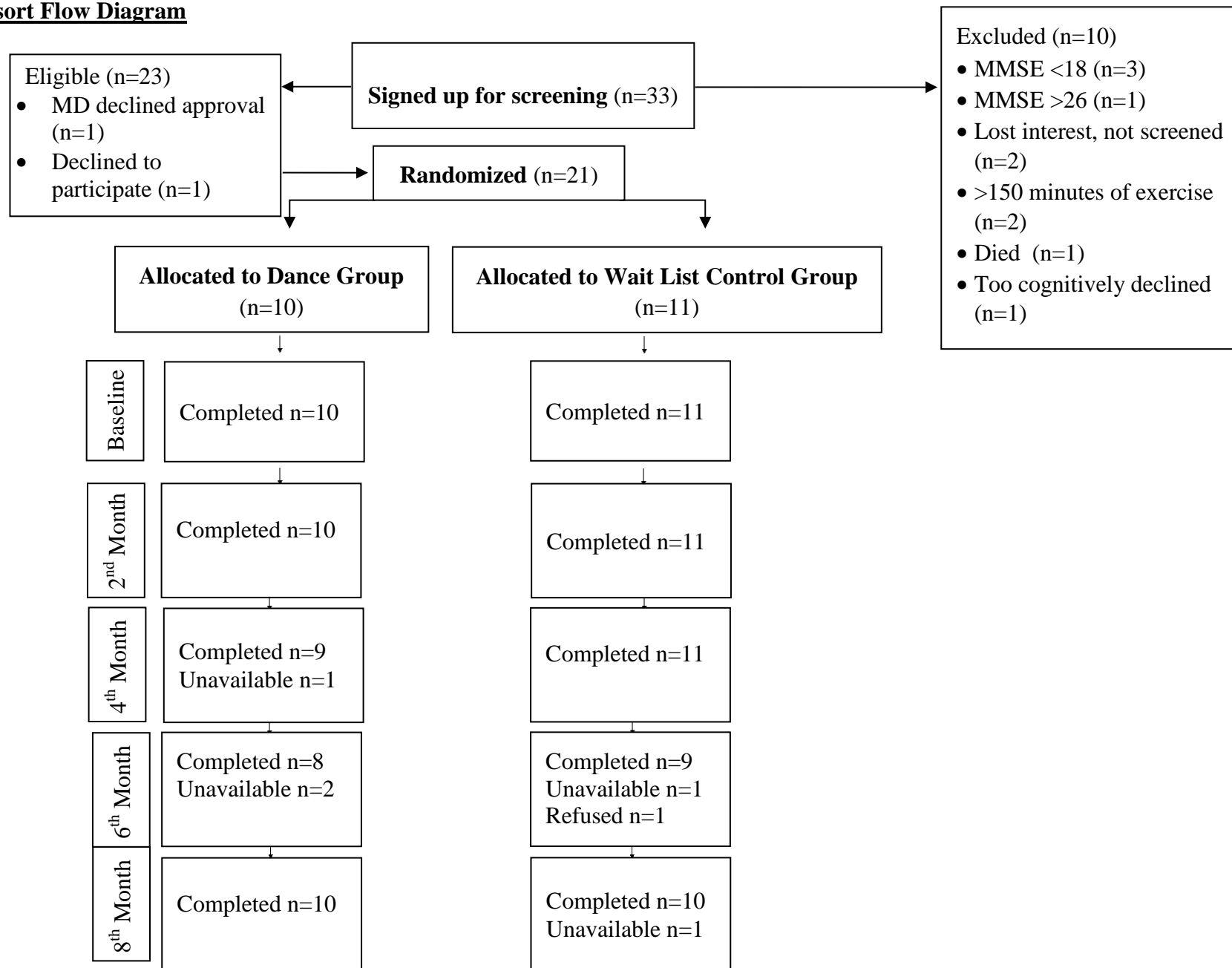
interventions were to take place in the community, researchers may want to consider the challenges we encountered in our study. Future dance studies should also involve a larger randomized controlled trial and should continue to include underserved populations. Delaying or reducing the risk of Alzheimer's disease and other dementias among older adults should be a priority. Improving individuals' quality of life and maintaining their independence has major positive implications for caregivers, families, and the economy.

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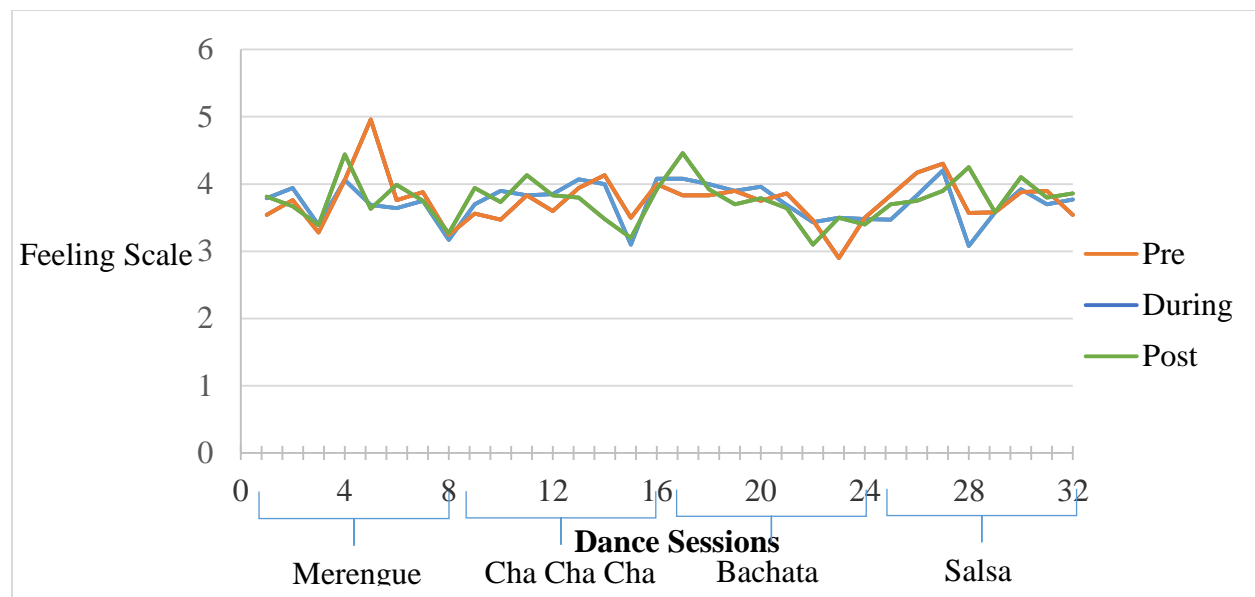
F. Figure 1. Consort Flow Diagram

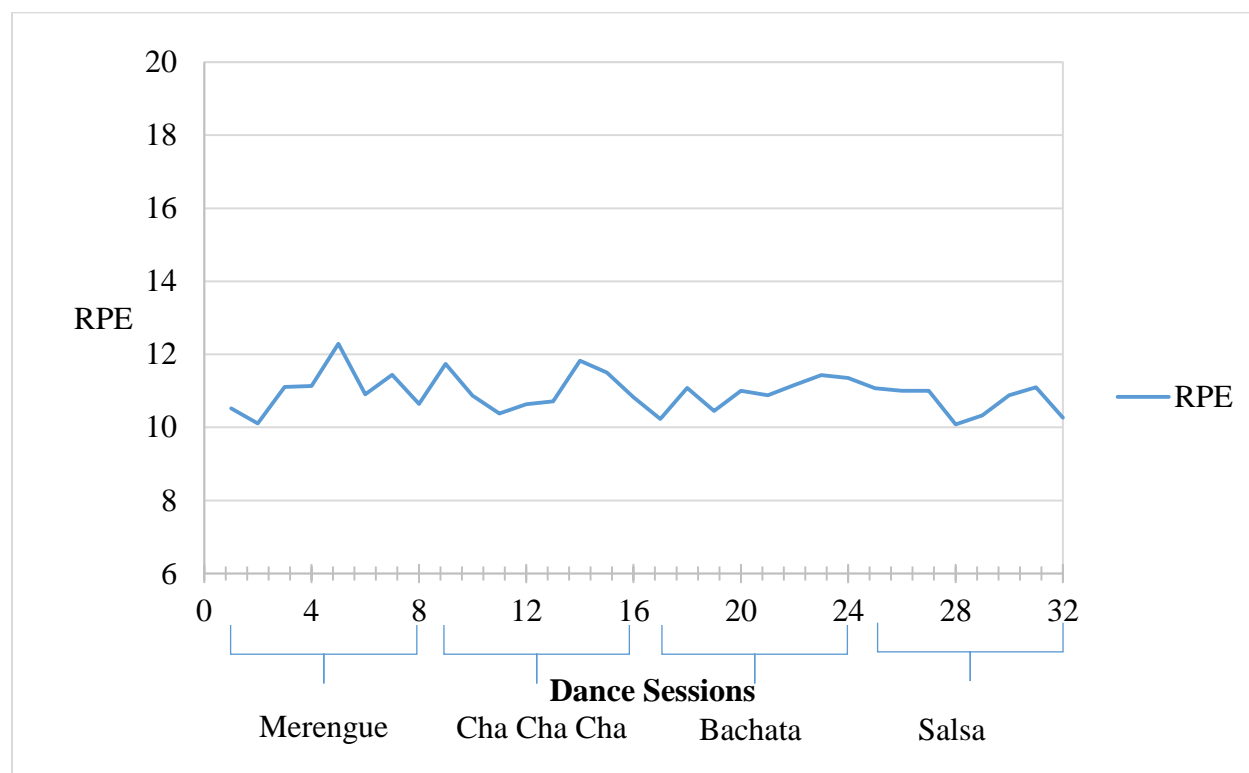
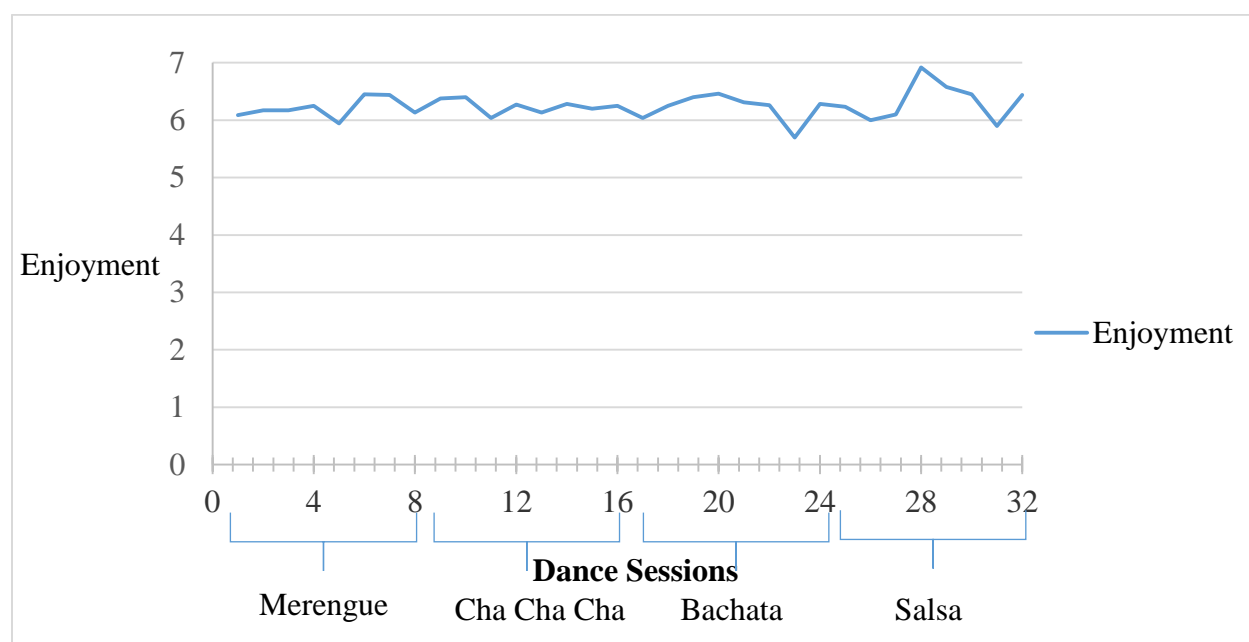
G. Table 1. Baseline Characteristics

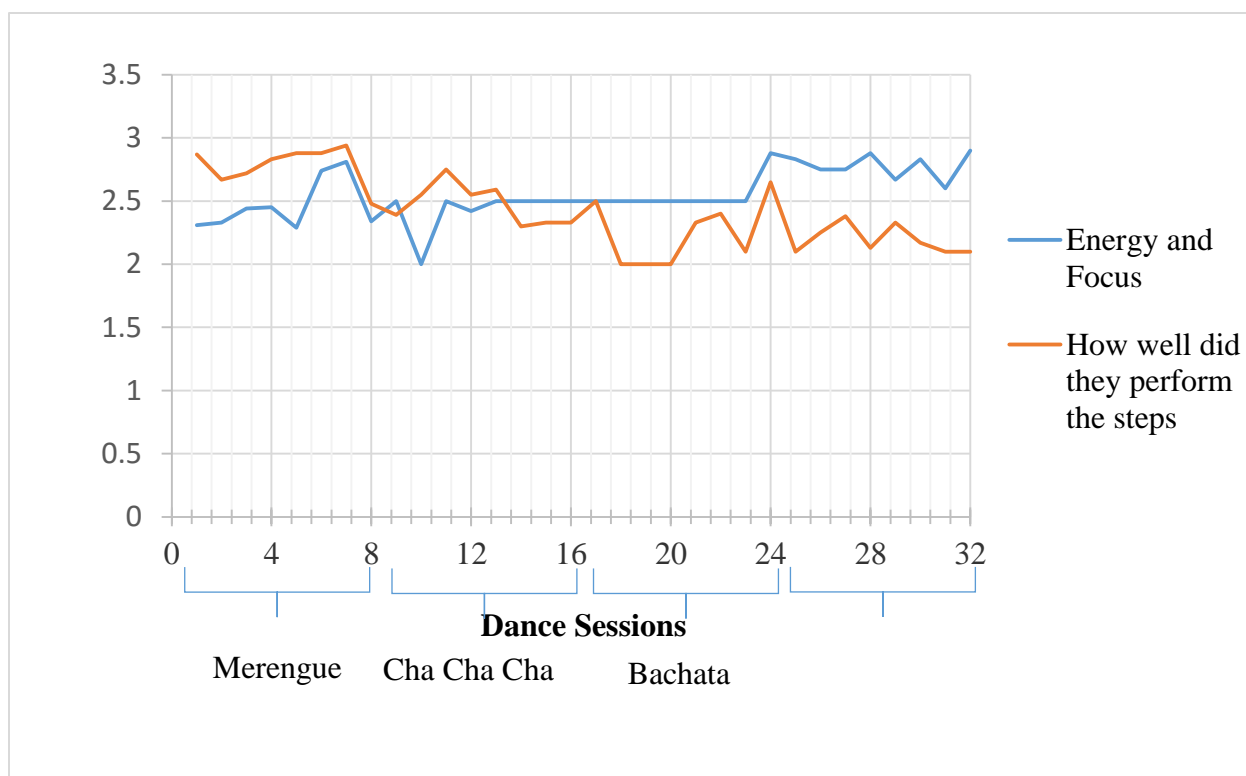
	All (n=21)	Dance (n=10)	Wait-List Control (n=11)
Age	75.4 (± 6.3)	76.0 (± 6.0)	74.9 (± 6.8)
Mini-Mental State Exam	22.4 (± 2.8)	21.5 (± 2.6)	23.2 (± 2.8)
BMI	27.7 (± 4.4)	26.3 (± 2.5)	29.0 (± 5.5)
Blood pressure			
Systolic	122.0 (± 18.2)	123.4 (± 22.5)	120.9 (± 14.3)
Diastolic	63.8 (± 10.0)	63.1 (± 9.9)	64.5 (± 10.4)
Waist Circumference	99.1 (± 9.3)	95.6 (± 6.8)	102 (± 10.5)
Women	16 (76.2%)	8 (80.0%)	8 (72.7%)
Widow/Widower	8 (38.1%)	6 (60.0%)	2 (18.2%)
Country of birth			
Caribbean	9 (42.9%)	5 (41.0%)	4 (36.4%)
South America	6 (28.5%)	3 (30.0%)	3 (27.3%)
Mexico	3 (14.3%)	2 (20.0%)	1 (9.1%)
Central America	2 (9.6%)	0	2 (18.2%)
Italy	1 (4.8%)	0	1 (9.1%)
Years in the U.S.	29.5 (± 20.1)	31.9 (± 19.3)	27 (± 21.5)
Annual Income < \$10, 000	11 (52.3%)	4 (40.0%)	7 (63.7%)
Education	6.3 (± 4.3)	7.2 (± 5.6)	5.6 (± 2.9)
Self-reported health problems			
High cholesterol	14 (66.7%)	7 (70.0%)	7 (63.6%)
High blood pressure	13(61.9%)	6 (60.0%)	7 (63.6%)
Cataracts	11 (52.4%)	5 (50.0%)	6 (54.5%)

Osteoarthritis	9 (42.9%)	3 (30%)	6 (54.5%)
Diabetes	8 (38.1%)	3 (30.0%)	5 (45.5%)
Depression	7 (33.3%)	2 (20.0 %)	5 (45.5%)
Cancer	4 (19.0%)	4 (40.0%)	0
Acculturation			
Speak in Spanish only	14 (66.7%)	8 (80.0%)	6 (54.5%)
Watch movies and TV, and listen to the radio in Spanish only	13 (61.9%)	7 (70.0%)	6 (54.5%)

H. Figure 2. Feelings Pre, During, and Post Dance Sessions



I. Figure 3. RPE Post Dance Sessions**J. Figure 4. Enjoyment of Dance Sessions****K. Figure 5. Dance Evaluations by Instructor after Dance Sessions**



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IV. Can a Latin Dance Program impact Physical Activity, Fitness, and Sedentary Behavior?

Susan Aguiñaga, MS and David X. Marquez PhD

A. Abstract

Physical inactivity, low levels of physical activity (PA) and low cardiorespiratory fitness (CRF), and sedentary behavior (SB) are associated with obesity, cardiovascular disease and cancer. Older adults, and more specifically older Latinos are 46% less likely to engage in leisure-time PA than older non-Latino whites and spend an average of 11.11 hours/day in SBs. Interventions that concomitantly improve PA and reduce SB among older Latinos have yet to be conducted by researchers. Thus, the purpose of this study was to determine if a Latin dance program infused with discussion sessions about SB information would have an impact on PA, CRF, and SB among older Latinos. Spanish-speaking older Latinos [N=21, 75.4 ± 6.3 years old, 76.2% female, 22.4 ± 2.8 MMSE score] were randomized into a 16 week, twice-weekly dance intervention or to a wait-list control group; the wait-list control group crossed over at week 17 and received the dance intervention. Participants were given a GT3X+ accelerometer to wear over their non-dominant wrist and an ActivPAL inclinometer on their non-dominant thigh for 7 consecutive days. The Sedentary Behavior Questionnaire (SBQ) was administered and a non-exercise equation was used to determine CRF. Data was collected at baseline, month 2, 4, 6, and 8. Repeated measures ANOVA were used to determine overall time effect and time x group interaction effects. We calculated Cohen's *d* values as an estimate of the effect sizes. Results revealed no time or interaction effects for accelerometer data or ActivPAL data. There was a significant time effect for CRF, $F(1.52, 28.90) = 15.99, p < .001$ and for the SBQ weekday sedentary time, $F(1.70, 32.27) = 5.73, p < .01$. These results warrant further research in the study of the impact of a Latin dance program and its impact on PA and SB related outcomes

among older Latinos with MCI. Researchers may consider recruiting older Latinos with MCI who are not attending an ADS center in order to determine whether PA programs are efficacious among individuals who do not have access to these centers.

Keywords: physical activity, sedentary behavior, older Latinos, accelerometers, ActivPALs

B. Introduction

Physical inactivity, low levels of physical activity (PA) and low cardiorespiratory fitness (CRF) are associated with an increased risk of heart disease, diabetes, and mortality (2009). More recent studies have also shown that sedentary behavior (SB), defined as sitting or reclining postures during waking hours (Sedentary Behaviour Research, 2012), is also associated with obesity, cardiovascular disease and cancer, independent of regular moderate-to-vigorous PA (MVPA) (Wilmot et al., 2012) (Sedentary Behaviour Research, 2012).

Older adults are one segment of the population that is particularly at risk for poor health. They have the lowest PA levels and the highest waking SB levels, spending more than 8 hours/day in sedentary behaviors, which cumulatively may result in low CRF (Nelson et al., 2007) (Matthews et al., 2008). PA and SB rates among older Latinos are even more alarming. Studies examining PA among ethnically diverse populations have found that older Latinos aged 65-74 are 46% less likely to engage in leisure-time PA than older non-Latino whites (Marquez et al., 2010). This comparison is less clear for SB due to the dearth of studies examining SB among Latinos (Rhodes et al., 2012) and studies relying on self-reported SB measures (Healy et al., 2011). However, a recent longitudinal cohort study found that in a representative sample of Latinos aged 65-74, older Latinos spent an average of 11.11 hours/day in sedentary behaviors as measured by accelerometer (Merchant et al., 2015). Interventions that concomitantly improve PA and reduce SB among older Latinos have yet to be conducted by researchers. A recent meta-

analysis found that clinically meaningful reductions in sedentary time can be produced within PA interventions that include some component of reducing SBs (Prince et al., 2014a).

Adult Day Service (ADS) centers are well positioned settings for preventing and ameliorating chronic diseases via PA and SB interventions among older adults. ADS centers offer a variety of services during daytime hours that support the health, nutritional, social, and daily living needs of adults with functional limitations (Fields et al., 2014). Over 40% of ADS participants have some form of disability, and nearly half of all ADS participants have mild cognitive impairment (MCI) (Fields et al., 2014). Few ADS centers in the United States cater to older Latinos. However, in Chicago, Casa Central's Adult Wellness Center offers bilingual and bicultural services to older Latinos. To the best of our knowledge, studies have not yet examined PA and SB of older Latinos attending ADS centers; nor have PA and SB interventions been implemented with this specific population.

A culturally appropriate dance program for older Latinos, BAILAMOS®, has previously shown that participation in this program can increase PA as measured by self-report questionnaire (Marquez et al., 2015). This program is being tested among older Latinos who are cognitively intact (Marquez et al., 2014), and it is unknown if this program could have a similar impact on PA among older Latinos with cognitive impairment. Thus, the purpose of this study was to determine if the BAILAMOS® program infused with discussion sessions about SB information would have an impact on PA measured by an accelerometer, CRF measured by a non-exercise equation, and SB measured by an inclinometer and a SB questionnaire among older Latinos attending an ADS center. We hypothesized that participants in the dance group would increase accelerometer counts and sit-to-stand transitions, improve their CRF, and reduce sedentary time.

C. Methods

Sample. Older Latinos were recruited via study flyers and announcements at an Adult Wellness Center (AWC) in Chicago to participate in a 16-week Latin dance program. The AWC is an adult day service center which offers bilingual and bicultural services to the Spanish-speaking older adult population of Chicago and provides many supervised, structured activities that maintain, improve, and restore participants' abilities. In order to attend the AWC, individuals must meet certain eligibility criteria, including > 60 years old, U.S. citizen, Illinois resident, physician authorization, and a score of 29 or higher on the Determination Need Assessment (DON). Inclusion criteria for the study were the following: (a) age \geq 60 years old, (b) self-identification as Latino/Hispanic, (c) ability to speak or understand Spanish (d) MCI with scores of 18-26 (McGough et al., 2011, Logsdon et al., 2010) as measured by the Mini Mental State Examination (Folstein et al., 1975), and (e) no plans to leave the country for more than two consecutive weeks over the next four months (study duration). Exclusion criteria included: (a) regular use of assistance to walk (e.g., cane), (b) stroke at any time, (c) >150 minutes of self-reported exercise defined as structured, planned, and repetitive aerobic activity like walking or swimming over an extended period of time with a specific objective such as increasing fitness, physical performance, or health (Bouchard et al., 1994). Additionally, participants who passed initial screening were asked to get medical clearance in order to participate in the research. Study approval was obtained from the University of Illinois at Chicago Institutional Review Board.

Design. The study was a pilot randomized controlled trial, with a wait-list control and crossover at 17 weeks. Participants who met inclusion criteria and completed baseline testing were randomized to either the dance program or the wait-list condition. Randomization was done by computer-generated random numbers and was delivered by a research staff member. The wait-list control group was asked to maintain their usual activities during weeks 1 through 16. At

week 17, after the post-intervention testing, the wait-list group crossed over and received the 16-week dance program, at which time the intervention group continued their usual activities. Both programs were led by the same professional dance instructor and participated in the same dance program.

Testing. All testing took place at the AWC. This was preferred because participants already attended the AWC, and the space necessary for testing was available. At the testing a bilingual research staff member, blinded to study condition, explained the study and read the Informed Consent to the participant. After participants agreed to participate, they signed the Informed Consent. Consent of participants on their own was deemed appropriate, since they had MCI, not dementia. Questionnaires and assessments were then administered, and all measures were available in Spanish or English. Participants were also given an ActiGraph accelerometer and ActivPal monitor to wear for one week. Testing occurred at Baseline, 2-months, 4-months, 6-months, and 8-months, to see if there were intermediate changes over time. For all time points questionnaires and tests were administered in the same order as baseline testing. Participants were compensated with \$15 dollars for completion of the questionnaires, and another \$15 dollars for returning their accelerometer and ActivPal monitors.

Intervention. BAILAMOS[®] includes a 4-month, twice-weekly program. Every dance session is one hour in length. Also, monthly discussion sessions were held. Readers can see a previous publication for a detailed description of the program (Marquez et al., 2014). For the current intervention, a research staff member was present at all dance sessions to set up the room and observe the class. Participants wore an orange Velcro bracelet on their right wrist and a green Velcro bracelet on their left wrist in order to help them distinguish between moves to the left and right. We followed the BAILAMOS[®] manual, but were cognizant of elements that seemed to

confuse participants. We recorded such challenges, and revised the program as needed. For example, if some of the dance turns that are part of BAILAMOS[®] were too confusing, we revised the moves in ways that still challenged participants physically and cognitively, but did not overwhelm them or put their safety at risk. The monthly discussion sessions were also modified from the original versions to include information about sedentary behavior and the benefits of reducing sedentary time and adding sit-to-stand transitions. During the first discussion session, we provided the participants with visual ActivPAL feedback in which they were shown an output page of their baseline ActivPAL data and asked to reduce the yellow (represents sedentary time) and increase green (represents standing) and red (represents stepping).

Measures

Objectively measured physical activity. Participants were given a triaxial GT3X+ accelerometer (Actigraph, Pensacola, Florida) over their non-dominant wrist since compliance of accelerometers is higher when worn on the wrist (Freedson and John, 2013, Troiano et al., 2014). Participants were instructed to wear the accelerometer for 7 consecutive days, and were asked to remove it for showering or swimming. Participants wore the accelerometer at baseline, month 2, month 4, month 6, and month 8. Wear time are reported in days and hours. Data were included if the participant wore the accelerometer for ≥ 3 days and ≥ 10 hours/day. Data were processed with ActiLife software with data converted to 60 second epochs. Average counts are reported.

Cardiorespiratory fitness. Cardiorespiratory fitness (CRF) was assessed using a validated regression equation that does not involve exercise testing (Jurca et al., 2005, Mailey et al., 2010). This equation estimates CRF based on sex, age, body mass index, resting heart rate, and level of physical activity on a scale from 1-5. CRF in METs was calculated using the following equation:

gender \times (2.77) – age \times (.10) – BMI \times (.17) – resting heart rate \times (.03) + physical activity score + 18.07 (Jurca et al., 2005).

Objectively measured sedentary behavior. Participants were given an ActivPAL 3TM® inclinometer monitor (PAL Technologies, Glasgow, Scotland, UK). The research assistant placed the ActivPal on their non-dominant leg (same side as accelerometer), and participants were asked to keep it on for 7 continuous days. Continuous wear was achieved by waterproofing the monitor with a nitrile sleeve to cover the monitor, wrapping it with a cushioned first aid tape (for comfort), and attaching it to the leg with an adhesive dressing (3M Tegaderm 9546HP). Participants were provided with written placement instructions and extra adhesive dressings in the event that they needed to remove the monitor and reattach it. Participants were requested to complete a sleep log in which they would record wake time and sleep time. Participants wore the ActivPAL at baseline, month 2, month 4, month 6, and month 8. The ‘Events’ files were used to analyze data; these list all bouts of sitting/lying, standing and steps, with the time each bout begins and bout duration (Edwardson et al., 2016). Waking time was isolated by using the sleep logs and visually identifying sleep times from the ‘Events’ files; this occurred when participants did not return the sleep logs. An extremely long bout of sitting/lying would be identified around late evening or early morning and that data would be removed from the file (Edwardson et al., 2016). Activity was classified as sedentary sum of time where activity code = 0, standing sum of time where activity code = 1, light sum of time where activity code = 1 or 2 and METs \leq 3 and MVPA as sum of time where METs > 3. Sit-to-stand transitions were also calculated as the total number of sedentary periods (Hamilton et al., 2004).

Subjectively measured sedentary behavior. The Spanish version of the Sedentary Behavior Questionnaire SBQ (Rosenberg et al., 2010) which has acceptable reliability (Munguia-Izquierdo

et al., 2013) was used to assess sedentary behavior at baseline, month 2, month 4, month 6, and month 8. This questionnaire assesses the amount of time sitting while doing 9 behaviors. Since this questionnaire was translated using Spanish from Spain, several words were changed to Spanish from Latin America, specifically Mexico, to convey appropriate meaning of certain words. Cronbach's alphas for the SBQ items was adequate, $\alpha = .84$.

Data Analysis. Data analysis was conducted in SPSS (IBM, version 22, Chicago, IL). All participants were encouraged to complete testing at all five time points regardless of dance attendance rate. An intent to treat analysis was employed. Missing data was imputed using the mean substitution method which involves replacing missing values with the mean of that variable. Between-group comparisons at baseline were conducted using independent t-tests. The primary analysis was from baseline (month 0) to month 4 comparing the dance intervention group with the wait-list control group. Repeated measures ANOVAs were used to determine overall time effect and time x group effects. We calculated Cohen's d values as an estimate of the effect sizes (small, .20; medium, .50; and large, .80; (Cohen, 1988)). The same analysis was also conducted for the participants who completed the program (termed completers), participants who dropped the program (termed non-completers), and the wait-list control group. The cross-over design permitted assessing if the intervention group maintained changes during the additional 16 weeks that the wait-list control group was receiving the dance intervention, and is referred to as the maintenance period (Figure 1). One group repeated ANOVA analysis was conducted for the maintenance period.

D. Results

Participant Characteristics. A total of 21 participants enrolled in the study. Ten participants were randomized to the dance intervention and 11 participants to the wait-list control group. The

mean age of the participants was 75.4 ± 6.3 years, mean MMSE score was 22.4 ± 2.8 , 76.2% were women, and mean years of education was 6.3 ± 4.3 years (Table 1).

Completers, Non-completers and Control Group. A repeated measures ANOVA was conducted for the completers, non-completers, and control group, however it was nearly identical to the primary analysis, thus we did not include it.

Objectively measured physical activity. Mean accelerometer wear time was assessed at all 5 time points. Wear time ranged from 18.33 hours to 20.07 hours, and days worn ranged from 7.50 to 8.85 days. Independent t-tests revealed no significant differences at baseline. The repeated measures ANOVA for the baseline, month 2, and month 4 time points revealed no time or interaction effects for the dance intervention. The dance group showed a small effect in the direction contrary to hypothesized, in which dance participants experienced a decrease in activity counts while participating in the dance intervention, $d = .24$.

Cardiorespiratory Fitness: Independent T-tests revealed no significant differences at baseline., The results of the repeated measures ANOVA with a Huyhn-Feldt correction indicated a significant time effect for baseline, month 2, and month 4 time points $F(1.52, 28.90) = 15.99, p < .001$. Pairwise comparisons indicated that there was a significant difference in CRF between baseline (M0) and post testing (M4) ($p = .01$), and between mid-testing (M2) and posttesting (M4), ($p = .01$). Interaction effects were not significant; however, Cohen's d revealed a large effect size, $d = 1.37$ for baseline and post testing (M4) time points.

Objectively measured sedentary behavior. Mean ActivPAL wear time was assessed at all 5 time points. Wear time ranged from 7.49 to 8.77 days. Independent T-tests revealed no significant differences between groups at baseline. The repeated measures ANOVA revealed no significant time or interaction effects. However, Cohen's d revealed a small-moderate effect for sitting time

and sit-to-stand transitions. Although not statistically significant, the dance group demonstrated an increase in sitting time, MVPA, steps, and transitions, and a decrease in light activity and standing.

Subjectively measured sedentary behavior. Independent t-tests revealed significant differences at baseline for weekday sedentary time where the dance group (5.95 ± 3.74) had lower sedentary time than the control group (10.8 ± 5.10); $t(19) = -2.46, p = .02$. The repeated measures ANOVA with a Huynh-Feldt correction indicated a significant time effect for weekday sedentary time, $F(1.70, 32.27) = 5.73, p < .01$ for the baseline, month 2, and month 4 time points. Interaction effects were not significant for weekday sedentary time. No significant differences were seen for weekend sedentary time.

Maintenance. The one group repeated ANOVA showed one significant time effect during the maintenance period. Dance participants decreased their CRF, $F(2, 18) = 5.58, p < .01$. Although not significant, when comparing the month 4 data to the month 8 data we saw that the dance participants increased in the following: accelerometer counts, ActivPAL light and MVPA activity and steps. They decreased in the following: sitting hours, sit-to-stand transitions, standing hours, and SBQ weekday and weekday sitting hours.

E. Discussion

This study assessed the impact of a Latin dance intervention on PA, CRF, and SB among older Latinos attending an ADS center. We found that PA as measured by accelerometer actually decreased after participation in the intervention. Marquez and colleagues found that PA, as measured by accelerometers, also decreased after participation in the dance intervention; however participants did self-report greater PA after a dance intervention (Marquez et al., 2015). Unfortunately, we did not include a self-reported PA measure in this study because we were only

allotted 2 hours with each participant and adding such questionnaire would put us over that time limit. Thus, we do not know if participants in the current intervention may too have self-reported higher PA post-intervention. We did, however, assess CRF. The measure that was used includes a question about self-reporting their level of PA on a five category index. The dance group did increase their CRF by 1.77 metabolic equivalents, which could be indicative of participants self-reporting higher PA. Interestingly, the wait-list control group also increased their CRF by 1.33 metabolic equivalents. Changes in CRF amongst the control group may be due to participation in other activities at the AWC or possibly, but highly unlikely, contamination effects. Whether these improvements are attributed to the dance intervention or the AWC programming, increasing CRF amongst this population is important because it is often accompanied by favorable changes in other health indicators such as triglycerides and glycemic control (Dunn et al., 1999); thus, it can have implications for improving their chronic diseases as well as slowing cognitive decline.

Along with decreased accelerometer counts, sedentary time as assessed by the ActivPAL also increased after participation in the intervention, although no statistical differences were seen between the intervention group and the control group. Our findings are in line with results from a recent review article that examined the effects of interventions that targeted PA and/or SB and that reported changes in SB. Seven of the 14 studies that targeted both PA and SB found no significant difference between the intervention and control groups (Prince et al., 2014a). However, we did see a small-medium effect in increased sedentary time. We speculate that this increase in sedentary time may be a result of compensatory effects, also known as the “activitystat hypothesis,” in which increase in activity in one part of the day may decrease activity in another part of the day (Rowland, 1998). These compensatory effects have mainly

been studied in children (Ridgers et al., 2014). Ridgers and colleagues found that when children spent more time in MVPA on one day, the following day was associated with less light PA and less MVPA. A study conducted among older adults found that older adults who engaged in < 10 hour per day in sedentary time on weekdays tended to be more sedentary during the weekend (Marshall et al., 2015). Although these studies compared one day to the following day and weekdays to weekends, we may be seeing a compensatory effect over the course of the intervention. In this study, participants may have increased their sedentary time as a result of participating in the dance intervention, and participants may have decided to do less movement overall, which can be seen by the accelerometer results. Older Latinos at this ADS center may be perceiving sitting time as a reward to having participated in a structured dance intervention. Another plausible explanation for this increase in SB and decrease in accelerometer counts is that older Latinos who attend this ADS center are able to freely come in and out of different activities. They may have perceived the hour long dance program as too structured or too tiring; thus increasing their time spent sitting throughout their day. Also, sedentary activities will often compete with physically active alternatives, thus older Latinos may be choosing the sedentary activities due to easy accessibility.

It should also be noted that although participants were screened about their PA participation prior to enrolling in the study, according to the ActivPAL, participants were already engaging in more than 30 minutes of MVPA at baseline. These high activity levels may be attributed to attending a culturally tailored ADS center.

Despite lower accelerometer counts and higher ActivPAL sitting time post-intervention, the dance group experienced a small-medium effect on sit-to-stand transitions. In a study targeting reduced sitting time and increased sit-to-stand transitions among older adults,

Rosenberg et al. also found that her intervention increased sit-to-stand transitions and steps as measured by the ActivPAL (Rosenberg et al., 2015). The dance group also showed a small-medium effect on reducing SB as measured by the SBQ. Thus, participants were self-reporting less time spent sedentary; however, this did not correspond to the ActivPAL sitting data. Our findings are contrary to the literature in which most self-reports estimate daily sedentary time two hours greater than what is measured by the accelerometer (Marshall et al., 2015). However, Rosenberg et al. also found that their participants were underreporting their sitting time on the SBQ in comparison to both the accelerometer data and ActivPAL data. To the best of our knowledge, no studies have examined self-reported SB and objectively measured SB among older adults with MCI. Thus, using objective and subjective measures to assess SB among older adults with MCI needs further exploration in order to compare whether older adults with MCI over-report or under-report their SB in comparison to their objective SB.

When examining the maintenance data for the dance group (comparing month 4 to month 8), data from month 8 indicate that participants decreased their CRF levels ($d = 1.07$), almost returning to baseline levels; thus, they were not able to maintain the CRF benefits that they gained during the intervention. Participants continued to self-report even less sitting time four months after the intervention had ended; however their ActivPAL sitting data showed that they were sitting more than twice as much as they were self-reporting.

Despite the small sample size, this study has four notable strengths. First, this study assessed PA, SB, and CRF among older Latinos attending an ADS center. To the best of our knowledge, no studies have assessed these outcomes among this population. These outcomes could be important not only for older Latinos themselves, but also, for ADS centers and stakeholders who deliver services to older adults. These data could serve as an indicator of how

well their programming is affecting their participants and could provide information as to whether they need to modify their programming so that their participants are more active and less sedentary. Second, we assessed PA, SB, and CRF using a mixture of objective and subjective measures. As such, we have demonstrated that older Latinos who have cognitive impairment and attend an ADS center have high compliance to wearing accelerometers on their wrist, wearing an ActivPAL continuously for ~7 seven days, and are able to answer questions about their sedentary behavior and level of PA. Another strength of the study is that we were able to assess maintenance among the dance participant during months 6-8. A fourth strength of the study was that we had a lot of control over the study because we had great support from the staff, and people were already going to the ADS center; thus, they did not have to come on their own.

The study also has a few limitations. One limitation of the study is that the program took place at an ADS. Participants in the study were already attending an ADS center, which offers many services and activities, thus these older Latinos with MCI had access to resources that other older Latinos may not have access to. Thus, there may have been ceiling or floor effects which may explain why we did not see significant changes in PA or SB outcomes. Another limitation of the study is the lack of a true control group. Because all participants were exposed to the enriched ADS environment, the control group had many opportunities to participate in other activities while the dance intervention was going on. Thus, rather than comparing our dance intervention to a control group, in reality, we are comparing our dance intervention to a rich array of other programming that is offered by the ADS.

Despite the lack of findings regarding the impact of the intervention, the data that was collected over the course of 8 months is of importance for evaluating ADS quality of

programming. Most research evaluating ADS programming have not assessed PA, SB, or CRF amongst their participants. A recent review of the impact of ADS centers on participants found that most research tends to focus on psychosocial well-being. Because PA is a correlate of psychosocial well-being, then examining PA, SB, and CRF amongst ADS participants is of importance. Furthermore, these data also provide important information of older Latinos who attend an ADS as studies examining ADS participants have mostly examined non-Latino whites (Anderson et al., 2013).

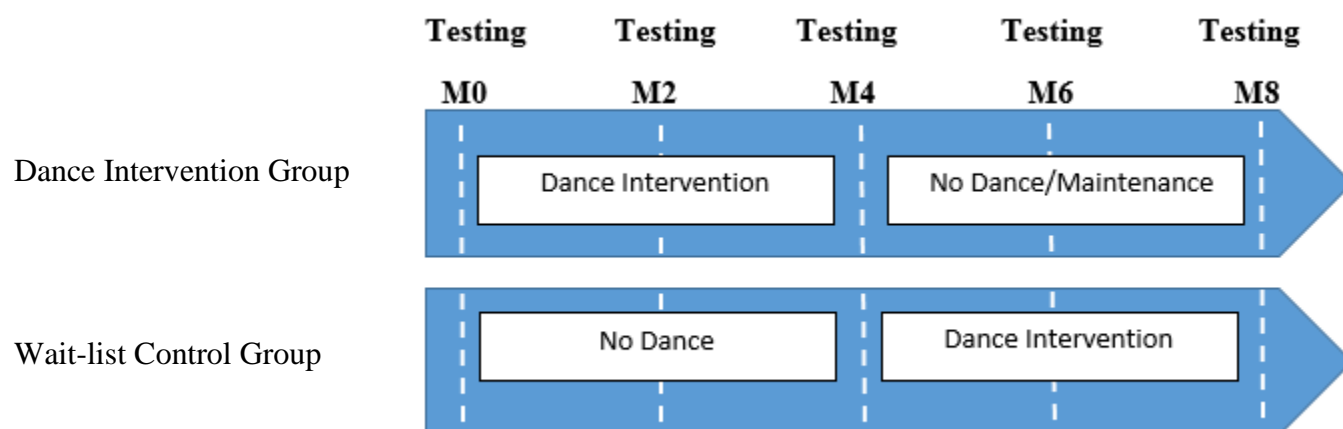
In conclusion, these results warrant further research in the study of the impact of a Latin dance program and its impact on PA and SB related outcomes among older Latinos with MCI. Future studies may consider shortening the time and increasing the frequency of PA programs for older Latinos with MCI in order to avoid the compensatory effects that we saw with our study. Researchers interested in achieving significant reductions in SB may also want to consider creating interventions that place a greater focus on SB while still emphasizing the importance of MVPA. Also, researchers may consider recruiting older Latinos with MCI who are not attending an ADS center, in order to determine whether PA programs are efficacious among individuals who do not have access to these centers.

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F. Figure 1. Intervention design**Figure 1.**

G. Table 1: Baseline Characteristics

	All (n=21)	Dance (n=10)	Wait-List Control (n=11)
	M ± SD N (%)	M ± SD N (%)	M ± SD N (%)
Age	75.4 (±6.3)	76.0 (±6.0)	74.9 (±6.8)
Mini-Mental State Exam	22.4 (±2.8)	21.5 (±2.6)	23.2 (±2.8)
BMI	27.7 (±4.4)	26.3 (±2.5)	29.0 (±5.5)
Waist Circumference	99.1 (±9.3)	95.6 (±6.8)	102 (±10.5)
Women	16 (76.2%)	8 (80.0%)	8 (72.7%)
Widow/Widower	8 (38.1%)	6 (60.0%)	2 (18.2%)
Country of birth			
Caribbean	9 (42.9%)	5 (41.0%)	4 (36.4%)
South America	6 (28.5%)	3 (30.0%)	3 (27.3%)
Mexico	3 (14.3%)	2 (20.0%)	1 (9.1%)
Central America	2 (9.6%)	0	2 (18.2%)
Italy	1 (4.8%)	0	1 (9.1%)
Years in the U.S.	29.5 (±20.1)	31.9 (±19.3)	27 (±21.5)
Annual Income < \$10, 000	11 (52.3%)	4 (40.0%)	7 (63.7%)
Years of Education	6.3 (±4.3)	7.2 (±5.6)	5.6 (±2.9)

H. Table 2. Accelerometer, Fitness and Sedentary Behavior Outcomes

Outcome	Month 0 M ± SD	Month 2 M ± SD	Month 4 M ± SD	M0-M4 Time effect (<i>p</i>) Time x Group (<i>p</i>) Cohen's <i>d</i>	Month 6 M ± SD	Month 8 M ± SD	M4-M8 (Maintenance) Time effect (<i>p</i>) Cohen's <i>d</i>
Accelerometer Counts							
Dance (n=9)	1,696,894.14 ± 716,353.85	1,734,203.12 ± 464,887.94	1,559,226.35 ± 497,513.09	.71	1,510,333.30 ± 434,594.25	1,617,436.15 ± 588,813.20	.66 .11
Control	1,521,186.82 ± 411,833.51	1,595,708.11 ± 547,530.33	1,659,438.76 ± 640,896.41	.17 .24			
CRF							
Dance	6.05 ± 1.68	6.49 ± 1.50	7.82 ± .96	.001 .67	6.83 ± 1.83	6.51 ± 1.56	.01
Control	5.84 ± 1.82	6.15 ± 2.04	7.17 ± 2.19	1.37			1.07
Activpal-sitting h/day							
Dance	8.44 ± 2.99	8.49 ± 2.54	9.47 ± 1.45	.51 .78	7.98 ± 1.64	8.87 ± 2.11	.06 .35
Control	10.55 ± 2.69	9.62 ± 2.76	10.55 ± 2.19	.46			
Activpal-light h/day							
Dance	5.49 ± 2.37	4.76 ± 1.68	5.34 ± 1.11	.58 .42	5.68 ± .84	5.38 ± .98	.54 .04
Control	4.42 ± 2.11	4.64 ± 1.17	4.76 ± 1.41	.09			
Activpal-MVPA min/day							
Dance				.92			.09
Control	42.33 ± 24.39 34.10 ± 25.39	44.60 ± 23.22 34.74 ± 15.41	42.73 ± 15.86 34.31 ± 15.59	.96 .02	38.02 ± 15.48	43.18 ± 21.69	.02
Activpal-steps steps/day							
Dance	2808.10 ± 1476.01	2913.06 ± 1425.11	2828.20 ± 887.61	.99	2586.09 ± 886.46	2898.56 ± 1319.85	.18 .07
Control	2220.31 ± 1381.76	2306.63 ± 973.29	2288.93 ± 945.29	.2 .02			
Outcome	Month	Month	Month	M0-M4	Month	Month	M4-M8

	0 M ± SD	2 M ± SD	4 M ± SD	Time effect (p) Time x Group (p) Cohen's d	6 M ± SD	8 M ± SD	(Maintenance) Time effect (p) Cohen's d
Activpal-sit-to-stand transitions/day							
Dance	40.71 ± 13.82	42.02 ± 16.04	44.81 ± 11.75	.34	42.83 ± 8.96	42.41 ± 8.86	.61
Control	39.57 ± 14.31	41.37 ± 11.53	44.10 ± 11.95	1.00			.24
				.34			
Activpal-Standing h/day							
Dance	4.91 ± 2.2	4.18 ± 1.45	4.73 ± .99	.52	5.09 ± .78	4.72 ± .90	.35
Control	3.98 ± 1.96	4.13 ± 1.08	4.27 ± 1.27	.41			.01
				.11			
SBQ-Weekday sitting (h/day)							
Dance	5.95 ± 3.74	6.18 ± 3.49	4.65 ± 2.96	.01	4.32 ± 2.10	3.90 ± 3.05	.50
Control	10.8 ± 5.10	7.3 ± 2.93	6.80 ± 3.81	.07			.26
				.41			
SBQ-Weekend sitting (h/day)							
Dance	4.68 ± 2.17	4.78 ± 5.42	4.31 ± 2.64	.46	4.27 ± 1.79	2.98 ± 2.86	.33
Control	9.93 ± 9.36	7.07 ± 2.45	9.66 ± 7.47	.37			.51
				.11			

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V. Can Older Latinos with Mild Cognitive Impairment Benefit Cognitively and Physically from a Latin Dance Program? A Randomized Controlled Study

Susan Aguiñaga, MS, Melissa Lamar, PhD, Edward Wang, PhD, Susan Hughes, PhD, Angela Odoms-Young, PhD, and David X. Marquez PhD

A. Abstract

Latinos are disproportionately more likely to have high rates of chronic disease, putting them at a higher risk of developing Alzheimer's disease than non-Latino whites. Addressing chronic diseases and cognitive decline via physical activity (PA) may help prevent or delay progression to AD. Thus, the purpose of this study was to examine the impact of the BAILAMOS© program on cognitive and physical function, quality of life, and depression among older Latinos with mild cognitive impairment (MCI). Spanish-speaking older Latinos [N=21, 75.4 ± 6.3 years old, 76.2% female, 22.4± 2.8 MMSE score] were randomized into a 16-week, twice-weekly dance intervention or to a wait-list control group; the wait-list control group crossed over at week 17 and received the dance intervention. Cognition was assessed using a subsample of the Spanish version of the Uniform Data Set. Physical function was assessed using the Short Physical Performance Battery (SPPB), Timed up and go (TUG), and Late-life function and disability instrument. The Quality of life-AD measure and Geriatric Depression Scale-15 (GDS-15) were also administered. Data was collected at baseline, month 2, 4, 6, and 8. Repeated measures ANOVAs were used to determine time effects and time x group interaction effects. We calculated Cohen's *d* values as an estimate of the effect sizes. Results showed significant time effects for the following cognitive tests: Trails B, $F(2, 38) = 3.42, p = .04$; Word Fluency, $F(2, 38) = 3.55, p = .04$; and digit modalities $F(1.67, 31.81) = 10.30, p = .001$. There were also time effects for the TUG, $F(2, 38) = 8.27, p = .001$ and the chair stand component of the SPPB, $F(2, 38) = 10.02, p < .000$. The GDS-15 showed an interaction effect, $F(1.61, 30.67) = 5.76, p = .01$

in the direction contrary to hypothesized. In conclusion, this pilot randomized controlled study revealed that a Latin dance program for older Latinos with MCI has modest effects on physical and cognitive function, but not more so than a waitlist control group. Future studies should involve a larger randomized controlled trial and should continue to include underserved populations.

Keywords: physical activity, aging, Latinos, mild cognitive impairment, cognition, physical function

B. Introduction

An estimated 5.2 million older adults 65 years and older are living with Alzheimer's disease (AD) in the United States (U.S) (Association, 2016). AD has a devastating toll on the individual, families, communities, and economy. Studies have revealed that Latinos in the U.S. are 1.5 times more likely to develop AD than non-Latino whites and are less likely to have a diagnosis of their condition (Haan et al., 2003). AD is often preceded by mild cognitive impairment (MCI) in which a person has cognitive decline, but it is not severe enough to meet the diagnostic criteria for dementia, nor does it impact everyday activities (Petersen et al., 1999). MCI is often characterized by the co-occurrence of cognitive and functional decline. Functional decline is associated with progressive loss of independence and reduced quality of life (McGough et al., 2011). The origin of cognitive impairment is not solely neurological, as cardiovascular and metabolic risk factors have been reported to be frequently associated with MCI (Yaffe et al., 2007). In particular, older Latinos have high

h levels of chronic diseases including diabetes and obesity (Daviglius et al., 2014) putting them at an even higher risk of developing MCI and related dementias. An epidemiological study assessing the relationship between comorbid diabetes and depression on cognitive impairment

showed that, among older Mexican Americans, comorbid diabetes and depression significantly increased risk for MCI and AD across cohorts, and this relationship was not seen in non-Latino whites (Johnson et al., 2015). Older adults with MCI and AD have also been reported to have higher rates of depression (Solfrizzi et al., 2007) (Houde et al., 2008), slower gait (Buracchio et al., 2010), and higher risk of falls than cognitively intact older adults (Anstey et al., 2006), however these relationships have been less studied among older Latinos.

Given the high burden of chronic disease among older Latinos and its relationship to MCI, addressing chronic diseases via physical activity (PA) may help to prevent or delay progression to AD. There is vast literature on PA and its ability to improve chronic diseases, and thereby improve cognitive function (Lu et al., 2016a), depression (Lee et al., 2014), gait speed (Hortobagyi et al., 2015) and reduce risk for falls (El-Khoury et al., 2013).

Unfortunately, older Latinos engage in low levels of PA. Older Latinos are 46% less likely to engage in leisure time PA than older non-Latino whites (Marquez et al., 2010). In order to make PA interventions more appealing to older Latinos, it has been suggested that interventions use culturally appropriate forms of PA (Cromwell and Berg, 2006b). Dance can be used as a culturally appropriate form of PA given that dance has been an important form of socialization, entertainment and leisure in Latin American countries (Delgado and Munoz, 1997). Dance is more likely to be adopted by older adults due to being a safe mode of PA, and it can be performed in a range of environments (Peri et al., 2008). Dance also requires individuals to observe, plan, monitor, and execute dance sequences and turns, which may increase activity of the premotor cortex and impact brain plasticity (Karpati et al., 2015), thus making it a viable option for preventing cognitive decline.

To the best of our knowledge, no studies have examined the impact of dance on health among older Latinos with MCI. Marquez and colleagues developed a Latin dance program, BAILAMOS©, for older, cognitively intact Latinos. Their first pilot study found small-moderate improvements in several aspects of cognition and mobility (Marquez et al., 2015). Thus, the purpose of this study was to examine the impact of the BAILAMOS© program on cognitive and physical function, quality of life, and depression among older Latinos with MCI. We hypothesized that the intervention would have greater improvements in cognition, physical function, quality of life, and symptoms of depression for dance participants relative to wait-list control participants; and small-medium effect sizes for the dance participants reflecting improvements in cognition, physical function, quality of life, and symptoms of depression.

C. Methods

Sample. Older Latinos were recruited via study flyers and announcements at an Adult Wellness Center (AWC) in Chicago to participate in a 16-week Latin dance program. The AWC is an adult day service center which offers bilingual and bicultural services to the Spanish-speaking older adult population of Chicago and provides many supervised, structured activities that maintain, improve, and restore participants' abilities. In order to attend the AWC, individuals must meet certain eligibility criteria, including > 60 years old, U.S. citizen, Illinois resident, physician authorization, and a score of 29 or higher on the Determination Need Assessment (DON). Inclusion criteria for the study were the following: (a) age \geq 60 years old, (b) self-identification as Latino/Hispanic, (c) ability to speak or understand Spanish (d) MCI with scores of 18-26 (Logsdon et al., 2010) (McGough et al., 2011) as measured by the Mini Mental State Examination (Folstein et al., 1975), and (e) no plans to leave the country for more than two consecutive weeks over the next four months (study duration). Exclusion criteria included: (a)

regular use of assistance to walk (e.g., cane), (b) stroke at any time, (c) >150 minutes of self-reported exercise defined as structured, planned, and repetitive aerobic activity like walking or swimming over an extended period of time with a specific objective such as increasing fitness, physical performance, or health (Bouchard et al., 1994). Additionally, participants who passed initial screening were asked to get medical clearance in order to participate in the research. Study approval was obtained from the University of Illinois at Chicago Institutional Review Board.

Design. The study was a pilot randomized controlled trial, with a wait-list control and crossover at 17 weeks. Participants who met inclusion criteria and completed baseline testing were randomized to either the dance program or the wait-list condition. Randomization was done by computer-generated random numbers and was delivered by a research staff member. The wait-list control group was asked to maintain their usual activities during weeks 1 through 16. At week 17, after the post-intervention testing, the wait-list group crossed over and received the 16-week dance program, at which time the intervention group continued their usual activities. Both programs were led by the same professional dance instructor and participated in the same dance program.

Testing. All testing took place at the AWC. This was preferred because participants already attended the AWC, and the space necessary for testing was available. At the testing a bilingual research staff member, blinded to study condition, explained the study and read the Informed Consent to the participant. After participants agreed to participate, they signed the Informed Consent. Consent of participants on their own was deemed appropriate, since they had MCI, not dementia. Questionnaires and assessments were then administered, and all measures were available in Spanish or English. Participants were also given an ActiGraph accelerometer and ActivPal monitor to wear for one week. Testing occurred at Baseline, 2-months, 4-months, 6-

months, and 8-months, to see if there were intermediate changes over time. For all time points questionnaires and tests were administered in the same order as baseline testing. Participants were compensated with \$15 dollars for completion of the questionnaires, and another \$15 dollars for returning their accelerometer and ActivPal monitors.

Intervention. BAILAMOS[®] includes a 4-month, twice-weekly program. Every dance session is one hour in length. Also, monthly discussion sessions were held. Readers can see a previous publication for a detailed description of the program (Marquez et al., 2014). For the current intervention, a research staff member was present at all dance sessions to set up the room and observe the class. Participants wore an orange Velcro bracelet on their right wrist and a green Velcro bracelet on their left wrist in order to help them distinguish between moves to the left and right. We followed the BAILAMOS[®] manual, but were cognizant of elements that seemed to confuse participants. We recorded such challenges, and revised the program as needed. For example, if some of the dance turns that are part of BAILAMOS[®] were too confusing, we revised the moves in ways that still challenged participants physically and cognitively, but did not overwhelm them or put their safety at risk. The monthly discussion sessions were also modified from the original versions to include information about sedentary behavior and the benefits of reducing sedentary time and adding sit-to-stand transitions. During the first discussion session, we provided the participants with visual ActivPAL feedback in which they were shown an output page of their baseline ActivPAL data and asked to reduce the yellow (represents sedentary time) and increase green (represents standing) and red (represents stepping).

Measures

Cognitive Measures

We used a subsample of the official Spanish version of measures in the Uniform Data Set (UDS) of the National Institute on Aging Alzheimer's Disease Center Program (Acevedo et al., 2009). Seven cognitive tests that assess functions that have been found to decrease with age but also be influenced by regular PA (Kramer et al., 2006) were administered at baseline, month 2, month 4, month 6, and month 8. Cognitive tests used in this study are as follows:

Logical Memory I and II (Wechsler, 1987) has two parts. A brief story is read to the participant who is then asked to retell it immediately (I) and after a 5-minute delay filled with other activities (II). The score is the number of the 25 story units recalled immediately (I) and after the delay (II).

Stroop Neuropsychological Screening Test (Trenerry et al., 1989) is part of the short form of the color task (Wilson et al., 2005) in which the participant is shown the names of colors printed in conflicting ink colors and is asked to name the words. The second task is the Color-Word task in which the participant is shown the names of colors printed in conflicting ink colors (e.g., the word "blue" in red ink) and is asked to name the color of the ink rather than the word. The scores are the number of words named correctly in 30 seconds minus the number of errors; and the number of colors named correctly in 30 seconds minus the number of errors (Wilson et al., 2005).

Digit Span Test (Wechsler, 1987) has two parts. Digit strings of increasing length are read and the participant is asked to repeat each string forward (Digit Span Forward) or backward (Digit Span Backward). The score is the number of correctly retrieved strings in each part (Wechsler, 1987).

Trail Making Test (TMT)-Parts A & B (AdjutantGeneral'sOffice, 1944) consist of two parts. It requires a participant to draw lines sequentially connecting 25 encircled numbers randomly

distributed on a page (Part A) and encircled numbers and letters in alternating order (Part B). The score is the time required to complete each task.

Word fluency (Welsh et al., 1994) asks participants to generate as many examples as possible from two semantic categories (animals; fruits and vegetables) in separate 60-second trials. The word fluency score is the sum of the number of animals generated with the number of fruits and vegetables generated.

Digit Ordering (Cooper et al., 1991, Wilson et al., 2005) involves reading digit strings of increasing length are read and the participant is asked to reorder the digits and say them in ascending order. The score is the number of correctly reordered strings.

Symbol Digit Modalities Test (Smith, 1982) involves identifying and naming the digits which belong with consecutively presented symbols. The score is the number of digits correctly paired with symbols in 90 seconds.

Short Physical Performance Battery (SPPB). Tests of balance (tandem, semi-tandem, and side-by-side stands), gait (time to walk 4 meters), and lower body strength and endurance (time to rise from a chair and return to the seated position, 5 times) was employed. A summary score ranging from 0 (worst performers) to 12 (best performers) is calculated by adding balance scores, gait speed, and chair stands. The SPPB has excellent reliability and sensitivity (Ostir et al., 2007) and is also widely used with older adults with CI (Balsamo et al., 2013, Hauer et al., 2012).

Timed up and go (TUG). Participants were instructed to rise from a seated position, walk 3 meters, turn, and return to a seated position. The TUG is widely used with older adults with CI (Balsamo et al., 2013, Hauer et al., 2012, Vreugdenhil et al., 2012).

Short Form- Late-life function and disability instrument (SF-LLFDI). The Function component of the SF-LLFDI (Sayers et al., 2004), but not the disability component was administered to

decrease response burden of the participants. It has been validated in Spanish (Abizanda et al., 2011), and several words in the questionnaire were changed from Spanish in Spain to Spanish from Latin America, to convey appropriate meaning of certain words to our sample. The SF-LLFDI is comprised of three domains: Upper Extremity functioning (items that reflect activities of the hands and arms), Basic Lower Extremity functioning (items that reflect activities primarily involving standing, stooping, and fundamental walking activities), and Advanced Lower Extremity functioning (items that reflect activities that involve a high level of physical ability and endurance). Scoring includes an overall function score and three separate domain scores. Higher scores indicate high levels in ability to perform discrete actions and activities.

Quality of life-Alzheimer's disease (QOL-AD). The Spanish version of the QOL-AD (Thorgrimsen et al., 2003) which has been validated in Spanish (Rosas-Carrasco et al., 2010) is a brief, 13-item measure designed specifically to obtain a rating of the participant's QOL from both the participant and the caregiver. For this study, only participants completed it in interview format about their own QOL. Total scores range from 13 to 52, with higher scores reflecting a higher QOL.

Geriatric Depression scale 15 (GDS-15). The validated Spanish version of the 15-item version of the GDS-15 was used to assess depressive symptoms (Lucas-Carrasco, 2012). The score ranges from 0 to 15 and a score of 0-4 is considered to be within the normal range, 5-9 indicates mild depression, and a score of 10 or more indicates moderate to severe depression (Almeida and Almeida, 1999).

Data Analysis. Data analysis was conducted in SPSS (IBM, version 22, Chicago, IL). All participants were encouraged to complete testing at all five time points regardless of dance attendance rate. An intent to treat analysis was employed. Missing data was imputed using the

mean substitution method which involves replacing missing values with the mean of that variable. Between-group comparisons at baseline were conducted using independent t-tests. The primary analysis was from baseline (month 0) to month 4 comparing the dance intervention group with the wait-list control group. Repeated measures ANOVAs were used to determine overall time effect and time x group effects. We calculated Cohen's *d* values as an estimate of the effect sizes (small, .20; medium, .50; and large, .80; Cohen, 1988). The same analysis was also conducted for the participants who completed the program (termed completers), participants who dropped the program (termed non-completers), and the wait-list control group. The cross-over design permitted assessing if the intervention group maintained changes during the additional 16 weeks that the wait-list control group was receiving the dance intervention, and is referred to as the maintenance period (Figure 1). One group repeated ANOVA analysis was conducted for the maintenance period.

D. Results

Participant Characteristics

A total of 21 participants enrolled in the study. Ten participants were randomized to the dance intervention and 11 participants to the wait-list control group. The mean age of the participants was 75.4 ± 6.3 years, mean MMSE score was 22.4 ± 2.8 , 76.2% were women, and mean years of education was 6.3 ± 4.3 years (Table 1).

Cognitive Outcomes

Independent t-tests revealed that there were no significant differences at baseline. The repeated measures ANOVA for the baseline, month 2, and month 4 time points showed significant time effects for Trails B,

$F(2, 38) = 3.42, p = .04$; Word Fluency, $F(2, 38) = 3.55, p = .04$; and digit modalities $F(1.67, 31.81) = 10.30, p = .001$ in which both groups improved on these cognitive measures. There were no interaction effects for any of the cognitive outcomes.

SPPB

The independent t-tests revealed no significant differences at baseline. The repeated measures ANOVA for the baseline, month 2, and month 4 time points showed a time effect for the chair stand, $F(2, 38) = 10.02, p < .000$, in which both groups improved on the chairs stand test (i.e., decreased the amount of time it took to stand from a chair 5 consecutive times).

Timed up and go

Independent t-test revealed no significant differences at baseline. The repeated measures ANOVA for the baseline, month 2, and month 4 time points showed a time effect, $F(2, 38) = 8.27, p = .001$ in which both groups improved their time to complete this task (i.e., decreased the amount of time it took to complete the test).

Late-life function and disability instrument-Function Component

Independent t-tests revealed no significant differences at baseline for the function component of the LLFDI. The function component of the LLFDI appeared to have good internal consistency, $\alpha = .77$. No time or interaction effects were seen for the baseline, month 2, and month 4 time points.

Quality of Life-AD

Independent t-tests revealed no significant differences at baseline. The QOL-AD had good internal consistency, $\alpha = .86$. The repeated measures ANOVA for the baseline, month 2, and month 4 did not have time or interaction effects.

GDS-15

Independent t-tests revealed no significant differences at baseline. The GDS-15 had good internal consistency, $\alpha = .83$. The repeated measures ANOVA for the baseline, month 2, and month 4 time points revealed no time effect, but did show an interaction effect $F(1.61, 30.67) = 5.76, p = .01$ in which dance participants reported a higher level of depression and the control group reported a lower level of depression post-intervention.

Non-completers, Completers, and Control Group

The one-way ANOVA revealed no significant differences among the three groups at baseline. The repeated measures ANOVA for the non-completers, completers and control group, showed significant time effects for the following measures: Word Fluency, $F(2, 36) = 3.19, p = .05$; Digit Modalities, $F(1.77, 31.77) = 6.92, p = .004$; Chair stand, $F(2, 36) = 15.32, p = .001$; and TUG, $F(2, 36) = 6.20, p = .01$. There was also a significant interaction for the GDS-15, $F(3.42, 30.81) = 3.00, p = .04$ and the Chair stand, $F(4, 36) = 3.08, p = .03$. As can be seen in Table 2, the control group significantly reduced their GDS-15 score by 1.82 and the completers increased their score on the GDS-15. Non-completers significantly improved more on the Chair Stand than the completers. Although not significant, there were a number of cognitive and physical tests in which the completers improved more in comparison to the non-completers and control group; Cognitive function: Logical Memory I and II, Stroop Word and Colors test, Verbal Fluency test; Physical function: 4-meter gait time, TUG, LL-FDI-Basic Lower, Advanced Lower, Upper Extremity, and overall function.

Maintenance

The one-group repeated ANOVA showed one significant time effect during the maintenance period. The dance group had a higher score on the LLFDI-Basic Lower Extremity

functioning component at month 8 than during the Month 4 post testing, which represents walking and standing activities, ($p = .01$). Although not significant, when comparing the month 4 data to the month 8 data we saw that the dance participants increased relative to themselves in the following: Logical Memory II, Digit Span Forward and Backward, Trails B, Digit Modalities, 4 meter gait speed and overall SPPB score, TUG, and LLFDI-overall function. Dance participants also declined in the following: Logical Memory I, Stroop Word and Color score, Trails A, Word fluency, Digit Order, Chair stand, LL-FDI- lower and upper function, QOL-AD, and GDS-15.

E. Discussion

This study provides some preliminary evidence for the support of the BAILAMOS© program for older Latinos with MCI. The program had small-large effects on several aspects of cognition and physical function. Our findings showed improvement among the dance group and worsening in performance among the wait-list control group for the logical memory-delayed recall and Stroop colors test: dance participants had a moderate effect size on the logical memory-delayed recall ($d = .56$), and the Stroop words and Stroop colors test ($d = .51$, $d = .51$) which reflect improvement in declarative memory and executive function, respectively. In a cardiorespiratory exercise intervention for older adults with MCI, Baker and colleagues found that increasing V02 peak was associated with improved executive function (Stroop test), however declarative memory (story recall) was unaffected by the intervention (Baker et al., 2010). Our findings are important because executive function, in particular, is the most sensitive cognitive domain to exercise interventions (Colcombe and Kramer, 2003). Declarative memory, specifically episodic memory, is a cognitive component that is severely affected in older adults with MCI (Teixeira et al., 2012), and PA has been shown to be positively associated with

episodic memory performance in older adults (Hayes et al., 2015). Thus, participation in a dance program may slow the progression of some cognitive symptoms associated with MCI.

Our study also found significant time effects for other cognitive tests, Trails B, word fluency, and digit modalities. Both groups improved on these cognitive tests, which may be due to practice effects. However, the improvement of both groups is likely due to the wait-list control group's participation in activities at the adult wellness program. It is highly plausible that while the dance group was receiving the intervention, another type of PA was simultaneously being offered to the AWC participants, and therefore the wait-list control group was active at the same time. Also, activities of all types are offered to AWC participants such as dominoes, arts and crafts, playing cards, bingo, and exercise classes. The AWC provides a constant enriched environment. Music is always playing and participants are encouraged to dance throughout the entire day. Even when some activities may appear as highly sedentary, the AWC brings physical activities into the rooms. For example, in one room, the participants play dominoes throughout the entire day; however, a staff person will bring in a basketball hoop and ask each participant to shoot hoops for a couple of minutes.

We also examined the impact of the dance intervention on QOL and depression, and found unexpected results. There was a small-moderate effect size in the direction contrary to what we hypothesized, in which the dance group reported lower QOL post-intervention, and the wait-list control group self-reported higher QOL. There was also a significant interaction ($p = .01$) and a moderate effect size in which the dance group self-reported higher depression levels post-intervention compared to pre-intervention, and the wait-list control group reported lower levels of depression. Our results are contrary to another study that examined the impact of a combined dance and relaxation intervention on QOL and depression among older adults with

MCI. Adam and colleagues found that participants in the intervention group decreased their depression levels and improved their QOL (Adam et al., 2016). Despite increasing levels of depression among the dance group in our intervention, all participants still had scores less than four, which is considered to be within the normal range.

This study also found significant time effects for the chair stand test ($p < .001$) and the TUG ($p = .001$). Other studies seeking to improve physical function among individuals with MCI/dementia have found similar results. A three month progressive resistance and functional group training intervention found that the intervention group improved their chair stand time by 25.9%, whereas our participants improved by 22.5%. Another study that examined the impact of a 6 month exercise program among older adults with MCI showed significant improvement (-1 second decrease) in the TUG (Uemura et al., 2013). Lu and colleagues found that participants in their momentum-based dumbbell training program for older adults with MCI improved their TUG time by .81 seconds (Lu et al., 2016b). Our study found that the dance group decreased their TUG time by 1.86 seconds, and the wait-list control group decreased by 1.97 seconds. Although contamination may have occurred in our intervention, improvements in physical function as seen in the chair stand test and TUG have positive clinical implications for this vulnerable population.

When assessing the outcome changes among the completers, non-completers, and control groups we saw similar time effects and interaction effects as the main analysis. However, when comparing the effect sizes of all dancers versus completers, there were some notable differences in which it was evident that the completers of the dance intervention improved more than the non-completers (i.e., Logical Memory I and II, Stroop Word and Colors test, Verbal Fluency test, 4-meter gait time, TUG, LL-FDI-Basic Lower, Advanced Lower, Upper Extremity, and overall

function). Furthermore, due to such a small sample size, the non-completers at times brought down the mean for the entire dance group for some of the outcomes. For example, the main analysis for the LLFDI-basic lower function component had shown that for the post-intervention, the dance group had reported a lower score on this measure. However, when solely assessing the completers, we see that completers actually reported a higher basic lower function score, and the non-completers reported a lower score on this measure. This pattern can be seen for several outcomes. Thus, by completing the dance program, older Latinos with MCI were able to experience benefits in several cognitive and physical function outcomes.

The maintenance data (month 4 through month 8) showed one statistically significant time effect for the LLFDI- Basic lower function component among the dance participants. Since the portion of this questionnaire represents walking activities, the dance participants simultaneously improved on the 4-meter gait test ($d = 38$); therefore their self-reported data is aligned with the objective measurement. The dance participants continued to improve on several outcomes, however this could be a reflection of practice effects or perhaps a result of involvement in other activities at the AWC.

Strengths of this study include objective and subjective measures of physical function, multiple measures of cognitive function, a diverse sample of older Latinos with MCI, and the implementation of a culturally appropriate PA intervention for older Latinos. To the best of our knowledge, studies have not examined the impact of PA on physical or cognitive function among older Latinos with MCI, and this population has a higher risk of developing AD. Our study also included older Latinos from diverse geographic and cultural backgrounds whereas most studies that include Latinos have primarily involved individuals of Mexican descent (Hunt et al., 2003).

Finally, our intervention addresses several barriers to being physically active such as cultural preferences and pre-existing medical conditions.

In spite of these strengths, we acknowledge a few limitations. First, our program took place at the AWC. Participants in the study were already attending AWC, which offers many services and activities, thus these older Latinos with MCI had access to resources that other older Latinos may not have access to. This could explain why participants in the wait-list control group also improved on physical and cognitive outcomes. Improvement in both groups on various measures may have also been due to practice effects. We collected data mid-intervention (month 2 and month 6) and had a total of 5 testing points over the course of 8 months. Although these mid-intervention testing points were meant to assess changes throughout the intervention period, participants may have improved due to exposure to these tests every two months. Another limitation of the study is the lack of a true control group. Because all participants were exposed to the enriched AWC environment, the control group had opportunities to participate in other activities while the dance intervention was going on. Thus, rather than comparing our dance intervention to a control group, in reality, we are comparing our dance intervention to a rich array of other programming that is offered by the ADS.

In summary, this randomized controlled study revealed that a Latin dance program for older Latinos with MCI has modest effects on physical and cognitive function. For this population these changes may be clinically meaningful. Whether improvement was due to our intervention or due to participation in AWC activities, it is imperative that researchers continue evaluating the impact of interventions and programming offered by centers such as the AWC. Researchers interested in this population should consider conducting research with older Latinos with MCI who are not attending AWCs in order to determine if PA interventions are efficacious

among individuals who do not have access to these centers/services. Researchers may also consider long term follow-ups to assess improvements in cognitive function as a result of PA. Future studies should involve a larger randomized controlled trial and should continue to include diverse, underserved populations. Our study included individuals with MCI and multiple comorbidities. Researchers interested in creating PA interventions should consider including these individuals since they represent the people that need these interventions the most.

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F. Figure 1. Intervention design

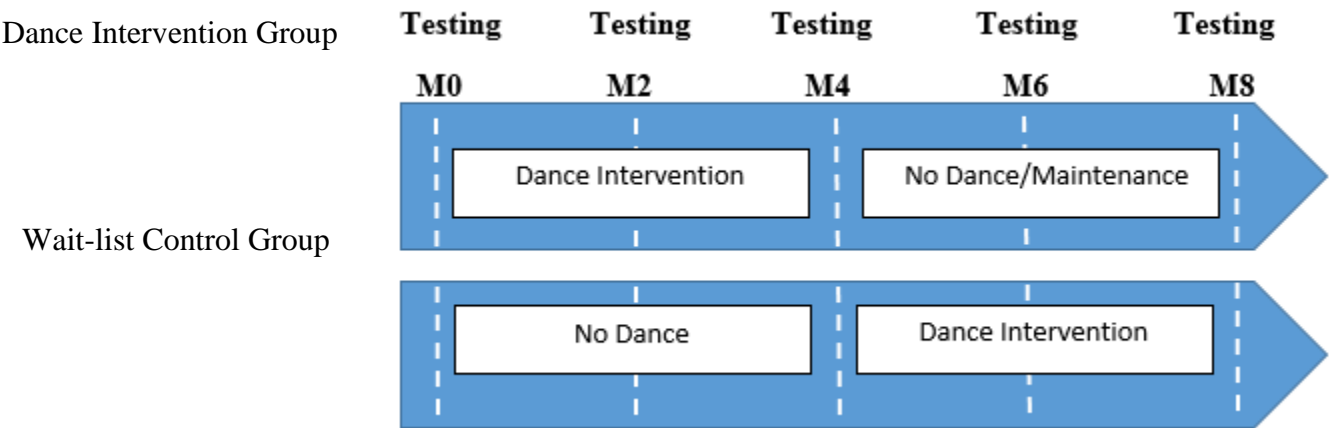


Figure 1.

G. Table 1. Baseline Characteristics

	All (n=21) M ± SD N (%)	Dance (n=10) M ± SD N (%)	Wait-List Control (n=11) M ± SD N (%)
Age	75.4 (±6.3)	76.0 (±6.0)	74.9 (±6.8)
Mini-Mental State Exam	22.4 (±2.8)	21.5 (±2.6)	23.2 (±2.8)
BMI	27.7 (±4.4)	26.3 (±2.5)	29.0 (±5.5)
Women	16 (76.2%)	8 (80.0%)	8 (72.7%)
Widow/Widower	8 (38.1%)	6 (60.0%)	2 (18.2%)
Country of birth			
Caribbean	9 (42.9%)	5 (41.0%)	4 (36.4%)
South America	6 (28.5%)	3 (30.0%)	3 (27.3%)
Mexico	3 (14.3%)	2 (20.0%)	1 (9.1%)
Central America	2 (9.6%)	0	2 (18.2%)
Italy	1 (4.8%)	0	1 (9.1%)
Years in the U.S.	29.5 (±20.1)	31.9 (±19.3)	27 (±21.5)
Annual Income < \$10, 000	11 (52.3%)	4 (40.0%)	7 (63.7%)
Years of Education	6.3 (±4.3)	7.2 (±5.6)	5.6 (±2.9)
Comorbidities	5.29 (±3.48)	4.30 (±2.75)	6.18 (±3.95)

H. Table 2. Change in Cognitive Function During Intervention Periods

	M0 M ± SD	M2 M ± SD	M4 M ± SD	M0-M4 Time (p) Interaction (p) Cohen's d	M6 M ± SD	M8 M ± SD	M4-M8 Time (p) Cohen's d
Dance n = 10 Control n= 11							
Logical Memory I-Immediate Recall				.26			.73
Dance	6.30 ± 3.02	7.20 ± 2.82	7.01 ± 3.89	.87	7.37 ± 3.46	6.9 ± 3.76	.03
Control	6.00 ± 3.49	6.73 ± 3.66	7.18 ± 4.51	.21			
Logical Memory II-Delayed Recall				.82			.52
Dance	4.80 ± 2.66	5.97 ± 3.37	6.38 ± 3.21	.15	7.3 ± 4.55	6.7 ± 4.06	.09
Control	6.00 ± 4.07	5.36 ± 3.04	5.18 ± 3.16	.56			
Stroop Test Word score				.07			.12
Dance	34.91 ±12.31	34.52 ± 12.88	40.97 ± 12.50	.58	32.37 ± 20.40	34.27 ± 16.70	.48
Control	35.18 ±16.96	31.73 ± 16.49	36.36 ± 13.03	.51			
Stroop Test Colors score				.53			.95
Dance	10.32 ± 7.50	12.94 ± 7.33	13.71± 6.58	.47	13.16 ± 7.72	13.02 ± 9.98	.09
Control	11.91 ±10.31	12.45± 3.39	11.45± 5.37	.51			
Digit Span Forward				.39			.08
Dance	4.70 ± 1.34	4.42 ± 1.89	4.86 ± 1.60	.74	5.28 ± 1.42	5.8 ± 1.93	.56
Control	3.82 ± 1.40	4.00 ± 1.18	4.36 ± 1.63	.11			
Digit Span Backwards				.53			.52
Dance	3.30 ± 2.36	3.22 ± 2.20	2.98 ± 1.25	.95	3.1 ± 1.10	3.4 ± 1.26	.35
Control	3.00 ± 1.10	3.09 ± 1.04	2.64 ± 1.21	.18			
Trails A				.19			.65
Dance	83.02 ±42.62	85.63 ± 36.98	79.31 ±42.59	.64	90.81 ± 76.45	87.15 ± 78.40	.13
Control	85.33 ±44.31	82.77 ± 38.17	71.15 ±41.88	.09			

Trails B							
Dance	226.12±73.19	244.85± 54.94	198.72±75.81	.04	200.26 ±70.95	177.51 ±78.94	.77
Control	271.18±43.90	248.72± 64.90	239.46 68.47	.22			.29
				.39			
Word Fluency- Total							
Dance	26.50 ± 9.59	29.56 ± 9.26	29.45 ± 9.02	.04	28.25 ± 10.32	28.8 ± 8.77	.73
Control	23.36 ± 7.10	25.82 ± 6.34	25.73 ± 8.22	.96			.08
				.33			
Digit Order							
Dance	3.40 ± 2.59	3.62 ± 2.46	4.15 ± 2.08	.12	3.62 ± 1.70	3.6 ± 2.22	.48
Control	3.82 ± 3.82	4.64 ± 2.11	4.82 ± 1.66	.77			.27
				.34			
Digit Modalities							
Dance	13.90 ±10.69	15.18 ± 11.46	18.58 ± 10.58	.001	18.39 ± 11.76	21.51 ± 10.97	.06
Control	12.18 ± 8.44	16.55 ± 8.13	19.18 ± 9.57	.47			.06
				.46			

I. Table 3. Change in Physical Function, Quality of Life, and Depression During Intervention Periods

	M0 M ± SD	M2 M ± SD	M4 M ± SD	M0-M4 Time (p) Interaction (p) Cohen's d	M6 M ± SD	M8 M ± SD	M4-M8 Time (p) Cohen's d
Dance n = 10 Control n = 11							
Chair Stand time				.00			
Dance	11.67 ± 2.52	13.41 ± 3.72	9.04 ± 4.01	.07	10.48 ± 1.76	10.02 ± 1.92	.77
Control	12.71 ± 2.52	13.26 ± 3.76	11.94 ± 3.06	.83			.33
4-Meter gait time				.49			
Dance	5.22 ± .74	5.28 ± .92	5.16 ± 1.40	.43	5.27 ± 1.00	4.77 ± .63	.43
Control	5.17 ± 1.17	4.72 ± .78	4.80 ± .80	.06			.38
SPPB score				.99			
Dance	9.90 ± 1.29	9.18 ± 2.43	9.37 ± 2.71	.17	9.65 ± 2.26	9.70 ± 3.20	.26
Control	9.45 ± 2.16	10.27 ± 1.85	10.00 ± 1.41	.26			.12

TUG							
Dance	14.51 ± 2.23	14.30 ± 2.95	12.65 ± 3.01	.00	12.84 ± 2.79	11.76 ± 1.66	.33
Control	13.96 ± 2.80	13.12 ± 2.16	11.99 ± 2.50	.79			.39
				.74			
LL-FDI							
Basic lower				.98			.01
Dance	23.00 ± 2.67	23.20 ± 4.34	22.68 ± 1.69	.84	23.75 ± 1.55	24.00 ± 1.25	.94
Control	21.91 ± 2.88	21.91 ± 2.12	22.18 ± 2.52	.16			
Advanced lower				.88			.40
Dance	18.50 ± 4.53	17.70 ± 5.98	18.86 ± 5.92	.76	19.67 ± 3.51	17.80 ± 5.27	.20
Control	18.55 ± 4.44	18.55 ± 3.75	18.27 ± 4.29	.07			
Upper extremity				.29			.90
Dance	23.20 ± 2.90	22.30 ± 3.37	23.48 ± 1.91	.98	23.15 ± 1.76	23.20 ± 2.30	.14
Control	22.18 ± 1.25	21.27 ± 2.94	22.18 ± 1.78	.12			
Overall function				.79			.54
Dance	64.70 ± 7.79	63.20 ± 12.51	64.84 ± 7.83	.98	66.56 ± 5.22	65.00 ± 7.33	.02
Control	62.64 ± 7.37	61.73 ± 7.20	62.64 ± 7.12	.02			
QOL-AD				.65			.20
Dance	40.90 ± 3.84	38.60 ± 3.81	38.82 ± 5.81	.21	36.14 ± 4.83	37.30 ± 4.47	.31
Control	36.91 ± 6.09	37.73 ± 5.53	37.64 ± 5.71	.45			
GDS-15				.36			.88
Dance	1.50 ± 1.72	2.80 ± 2.53	2.70 ± 2.58	.01	2.64 ± 2.66	3.00 ± 3.02	.11
Control	3.18 ± 3.63	2.55 ± 2.07	1.36 ± .92	.58			

J. Table 4. Change Cognition, Physical Function, Quality of Life, and Depression among Non-completers (n=4), Completers (n=6), and Control Group (n=11)

	M0 M ± SD	M2 M ± SD	M4 M ± SD	Wave 1 Time (p) Interaction (p) Cohen's d
Logical Memory- Immediate Recall				
Non-Completers	7.00 ± 2.31	7.17 ± 3.43	7.68 ± 3.67	.46
Completers	5.83 ± 3.54	7.17 ± 3.54	7.67 ± 3.89	.61
Control	6.00 ± 3.49	6.73 ± 3.66	7.18 ± 4.51	.52
Logical Memory- Delayed Recall				
Non-Completers	5.25 ± 1.50	6.66 ± 3.02	5.69 ± 3.86	.58
Completers	4.50 ± 3.33	5.50 ± 3.78	6.83 ± 2.99	.24
Control	6.00 ± 4.07	5.36 ± 3.04	5.18 ± 3.16	.78
Stroop Test Word score				
Non-Completers	40.76 ± 11.72	40.53 ± 9.23	40.78 ± 10.92	.12
Completers	31.01 ± 12.02	30.51 ± 14.13	41.09 ± 14.48	.40
Control	35.18 ± 16.96	31.73 ± 16.49	36.36 ± 13.03	.80
Stroop Test Colors score				
Non-Completers	15.00 ± 4.90	16.92 ± 4.78	13.88 ± 3.22	.48
Completers	7.19 ± 7.59	10.28 ± 7.89	13.59 ± 8.46	.32
Control	11.91 ± 10.31	12.45 ± 3.39	11.45 ± 5.37	.84
Digit Span Forward				
Non-Completers	5.25 ± .50	3.80 ± 2.64	5.15 ± 1.74	.30
Completers	4.33 ± 1.63	4.83 ± 1.33	4.67 ± 1.63	.23
Control	3.82 ± 1.40	4.00 ± 1.18	4.36 ± 1.63	.22
Digit Span Backwards				
Non-Completers	3.50 ± 1.91	3.04 ± 2.16	2.95 ± .10	.62
Completers	3.17 ± 2.79	3.33 ± 2.42	3.00 ± 1.67	.98
Control	3.00 ± 1.10	3.09 ± 1.04	2.64 ± 1.21	.08
Trails A				
Non-Completers	76.50 ± 50.18	85.53 ± 46.31	78.26 ± 50.25	.38
Completers	87.73 ± 41.25	85.69 ± 34.27	80.01 ± 41.83	.85
Control	85.32 ± 44.31	82.77 ± 38.17	71.15 ± 41.88	.20
Trails B				
Non-Completers	234.18 ± 55.03	222.19 ± 57.03	213.28 ± 49.21	.06
Completers	220.74 ± 87.96	259.96 ± 52.88	189.02 ± 92.79	.19
Control	271.18 ± 43.90	248.72 ± 64.90	239.46 ± 68.47	.37

Word Fluency				
Non-Completers	27.00 ± 11.17	30.40 ± 12.37	25.88 ± 9.94	.05
Completers	26.17 ± 9.52	29.00 ± 7.85	31.83 ± 8.38	.20
Control	23.36 ± 7.10	25.82 ± 6.34	25.73 ± 8.22	.67
Digit Order				
Non-Completers	3.75 ± 2.50	3.79 ± 2.37	4.88 ± 2.17	.18
Completers	3.17 ± 2.86	3.50 ± 2.74	3.67 ± 2.07	.90
Control	3.82 ± 2.04	4.64 ± 2.11	4.82 ± 1.66	.21
Digit Modalities				
Non-Completers	15.50 ± 12.66	15.72 ± 11.15	18.72 ± 11.44	.00
Completers	12.83 ± 10.30	14.82 ± 12.70	18.48 ± 11.09	.73
Control	12.18 ± 8.45	16.55 ± 8.13	19.18 ± 9.57	.56
Chair Stand time				
Non-Completers	12.23 ± 2.36	14.52 ± 3.68	7.68 ± 5.19	.00
Completers	11.30 ± 2.78	12.67 ± 3.89	9.99 ± 3.21	.03
Control	12.71 ± 2.52	13.26 ± 3.76	11.94 ± 3.06	.54
4-Meter gait time				
Non-Completers	5.09 ± .97	5.59 ± 1.16	5.56 ± 1.75	.89
Completers	5.31 ± .64	5.07 ± .77	4.89 ± 1.21	.35
Control	5.17 ± 1.17	4.72 ± .78	4.80 ± .80	.46
SPPB score				
Non-Completers	9.25 ± 1.26	8.69 ± 2.95	7.93 ± 3.51	.83
Completers	10.33 ± 1.21	9.50 ± 2.26	10.33 ± 1.75	.24
Control	9.45 ± 2.16	10.27 ± 1.85	10.00 ± 1.41	.00
TUG				
Non-Completers	14.35 ± 2.28	14.93 ± 4.06	14.47 ± 3.77	.01
Completers	14.61 ± 2.42	13.88 ± 2.27	11.44 ± 1.82	.20
Control	13.96 ± 2.80	13.12 ± 2.16	11.99 ± 2.50	1.56
LL-FDI				
Basic lower				
Non-Completers	23.50 ± 1.91	21.00 ± 6.73	21.61 ± 1.36	.92
Completers	22.67 ± 3.20	24.67 ± .52	23.40 ± 1.57	.25
Control	21.91 ± 2.88	21.91 ± 2.12	22.18 ± 2.52	.31
Advanced lower				
Non-Completers	16.75 ± 6.13	12.50 ± 5.57	13.14 ± 4.89	.64
Completers	19.67 ± 3.20	21.17 ± 3.13	22.67 ± 2.25	.12
Control	18.55 ± 4.44	18.55 ± 3.75	18.27 ± 4.29	1.14
Upper extremity				
Non-Completers	24.75 ± .50	21.75 ± 4.72	22.45 ± 2.07	.25
Completers	22.17 ± 3.43	22.67 ± 2.58	24.17 ± 1.60	.29
Control	22.18 ± 1.25	21.27 ± 2.94	22.18 ± 1.78	.79
Overall function				
Non-Completers	65.00 ± 6.38	55.25 ± 16.52	57.17 ± 4.99	.57
Completers	64.50 ± 9.20	68.50 ± 5.79	69.95 ± 4.14	.14
Control	62.64 ± 7.37	61.73 ± 7.20	62.64 ± 7.12	.81

QOL-AD				
Non-Completers	40.50 ± 3.70	37.25 ± 4.27	40.05 ± 7.86	.38
Completers	41.17 ± 4.26	39.50 ± 3.56	38.00 ± 4.65	.24
Control	36.91 ± 6.09	37.73 ± 5.53	37.64 ± 5.71	.75
GDS-15				
Non-Completers	.50 ± 1.00	2.50 ± 2.38	2.25 ± 3.30	.33
Completers	2.17 ± 1.83	3.00 ± 2.83	3.00 ± 2.28	.04
Control	3.18 ± 3.63	2.55 ± 2.07	1.36 ± .92	.42

K. References

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APPENDICES

A. IRB Approval

UNIVERSITY OF ILLINOIS AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Approval Notice Amendment to Research Protocol and Consent Documents – Expedited Review UIC Amendment # 3

March 16, 2015

David Xavier Marquez, PhD
Department of Kinesiology and Nutrition
1919 W Taylor St., Room 625
M/C 994
Chicago, IL 60612
Phone: (312) 996-0152 / Fax: (312) 413-0319

RE: **Protocol # 2014-1067**
“LUCID: Latinos Unique scenario, Cognitive Impairment addressed via Dance”

Dear Dr. Marquez:

Members of Institutional Review Board (IRB) #2 have reviewed this amendment to your research and consent forms under expedited procedures for minor changes to previously approved research allowed by Federal regulations [45 CFR 46.110(b)(2)]. The amendment to your research was determined to be acceptable and may now be implemented.

Please note the following information about your approved amendment:

Please note that investigator training for Migdalia Vazquez will expire on 9 April 2015 and she will not be eligible to be involved in research conducted at UIC after that date unless or until her training is updated.

Amendment Approval Date:

March 16, 2015

Amendment:

Summary: UIC Amendment #3, dated 4 March 2015 and submitted to OPRS 9 March 2015, is an investigator-initiated amendment regarding the following:

(1) revising research procedures to randomize subjects to the intervention group or to a control group that will be waitlisted for the intervention for four months, participants in both groups will be evaluated at two months and four months but data will not be collected from the control group during their participation in the intervention; adding exclusion criteria of having had a stroke and doing more than 150 minutes of structured, planned aerobic activity per week over an extended period of time (excluding daily activities such as running errands); removing

2014-1076

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compensation via lottery as all participants will eventually participate in the compensated intervention (Initial Review application, v6, 3/4/2015; Research Protocol, v4, 3/4/2015); and (2) submission of recruitment and consent documents reflecting the above (Introduction and Screening Script, English + Spanish, v6, 3/4/2015; Physician Approval, v3, 3/4/2015; Informed Consent, English + Spanish, v5, 3/4/2015).

Approved Subject Enrollment #: 50
Performance Sites: UIC
Sponsor: Rush University
PAF#: 2014-05441
Grant/Contract No: Not applicable
Grant/Contract Title: Not applicable
Research Protocol:

- a) LUCID: Latinos Unique scenario, Cognitive Impairment addressed via Dance; Version 5; 03/04/2015

Recruiting Materials:

- a) LUCID Introduction and Screening (English); Version 6; 03/04/2015
 b) LUCID Introduction and Screening (Spanish); Version 6; 03/04/2015
 c) Physician Approval; Version 3; 03/04/2015
 d) LUCID Recruitment Script (Spanish); Version 5; 03/04/2015
 e) LUCID Recruitment Script (English); Version 5; 03/04/2015

Informed Consents:

- a) LUCID Informed Consent (Spanish); Version 5; 03/04/2015
 b) LUCID Informed Consent (English); Version 5; 03/04/2015

Please note the Review History of this submission:

Receipt Date	Submission Type	Review Process	Review Date	Review Action
03/09/2015	Amendment	Expedited	03/16/2015	Approved

Please be sure to:

→ Use only the IRB-approved and stamped consent documents when enrolling subjects.

→ Use your research protocol number (2014-1067) on any documents or correspondence with the IRB concerning your research protocol.

→ Review and comply with all requirements on the OPRS website under:

"UIC Investigator Responsibilities, Protection of Human Research Subjects"
 (<http://tiger.uic.edu/depts/ovcr/research/protocolreview/irb/policies/0924.pdf>)

Please note that the UIC IRB #2 has the right to ask further questions, seek additional information, or monitor the conduct of your research and the consent process.

Please be aware that if the scope of work in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.

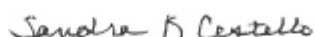
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We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS at (312) 996-1711 or me at (312) 996-2014. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,



Sandra Costello
Assistant Director, IRB # 2
Office for the Protection of Research Subjects

Enclosures:

1. Informed Consent Documents:

- a) LUCID Informed Consent (Spanish); Version 5; 03/04/2015
- b) LUCID Informed Consent (English); Version 5; 03/04/2015

2. Recruiting Materials:

- a) LUCID Introduction and Screening (English); Version 6; 03/04/2015
- b) LUCID Introduction and Screening (Spanish); Version 6; 03/04/2015
- c) Physician Approval; Version 3; 03/04/2015
- d) LUCID Recruitment Script (Spanish); Version 5; 03/04/2015
- e) LUCID Recruitment Script (English); Version 5; 03/04/2015

cc: Charles B. Walter, Department of Kinesiology and Nutrition, M/C 517

B. FOCUS GROUP GUIDE

LUCID: Latinos Unique scenario, Cognitive Impairment addressed via Dance Focus Group Guide

I.	Welcome and Introductions	(5 minutes)
II.	Memory loss	(10 minutes)
III.	Degree of enthusiasm for dance	(10 minutes)
IV.	Benefits of dance	(10 minutes)
V.	BAILAMOS program	(25 minutes)
Total estimates)		~ 1 hour (above times are

As you get settled in, and before we get started with the group, we have a few questionnaires for you to complete. If you have any questions or need any assistance, please let us know.

I. I. Welcome & Introductions (~ 5 MIN)

II.

“Thank you for participating in this focus group. My name is David Marquez and I am a Professor at the University of Illinois at Chicago. We appreciate your willingness to take time to participate. A focus group is a group discussion. We want you to know that each of your opinions and perspectives are important to us. There is no right or wrong answers. We only ask that you be as open and honest with us as possible. You were selected for this group because you participated in the LUCID feasibility study. We are hoping to better understand your experience with the dance program in order to help us design more effective programs for older Latinos to become more physically active.”

“My role is to be your guide by asking questions and keeping us on time, but this is really YOUR time to talk.

You will notice that we are taping this group in order to accurately report all ideas. Your name will NOT be associated with anything you say. Also, the tapes will be kept private and safe. When the tapes are transcribed, participants will be identified by a code.

At this point please turn off your cell phones if you have not done so already.”

In addition, guidelines for participating in focus groups should be clarified and expressed. Focus group members should be told:

“It is important to ‘be a good group member.’ This means that participants should be non-judgmental and not critical of others. Please speak when you have something to say, even if it is a different opinion than others might have. Although you can disagree with each other, be sure not to interrupt other members. Also, if you notice that I am not giving you eye contact, I am not trying to be rude, I just want you to speak to the other people here, not to me. In order to maintain confidentiality, please do not discuss what you hear in this group with people outside this group in any way that might identify the people you met here. Finally, there is a lot of information that we would like to cover today, so there may be times that I need to stop you and move on to a new topic. Are there any questions before we get started?”

Introductions

We are going to start with some introductions. We will not go in order around the room, please just jump in when you’d like to. (*Facilitator, do not just have them go around the room introducing, it should be more random – popcorn it*) Please share with us:

Your name (first name only)

Where you are from (can be city/country of origin or current home)

What is the **best** thing about your country of origin?

The focus group will consist of several topics of interest. Be sure to stick to this order of questioning. Also, do not share personal information or give your opinion on the topic, even if asked.

III. Memory Loss **(10 minutes)**

- a. Tell me about your memory problems
- b. How do they affect your day-to-day living?
- c. What are the main concerns regarding your memory problems at this time?
- d. What activities can you do to help your memory?

IV. Degree of enthusiasm for dance **(10 minutes)**

- a. Is dance a good form of exercise?
- b. Is dancing enjoyable for many people?
- c. What do people like most about dancing?
- d. What do people like least?

V. Benefits of dance **(10 minutes)**

- a. How could dancing influence health?
- b. How could dancing affect your ability to move around?
- c. How does dancing affect your memory?

VI. BAILAMOS Program

- a. Environment
 - i. What did you think of the timing of the program?
 - ii. Was there enough room to move around while you were dancing?
 - iii. Was the length of the program appropriate?
 - 1. Too long, too short?
- b. Instructor
 - i. What are your thoughts on the instructor?
 - ii. Was the instructor enthusiastic and friendly?
 - iii. Did the instructor help you adapt the dances to fit your level of ability?
 - iv. Did the instructor clearly explain the dance steps?
- c. Dance Program
 - i. Were the steps too hard given your physical condition(s)?
 - ii. Did the dance styles progress at an appropriate pace for you?
 - iii. Were the dance routines fun to do?
 - iv. Is one instructor sufficient?
 - 1. Would you want your carepartner to participate in the program with you'?
 - v. How can we improve the dance routines (for example, how the class was conducted, or music suggestions)?
- d. Future directions
 - i. Do you plan on doing the BAILAMOS dances on your own?
 - ii. Do you plan on engaging in other physical activities on your own?
 - iii. Would you recommend this program to other friends/family?
 - iv. Overall, as the program worth your time?

Overall, is there anything else we should have asked you?

Thank you for your time.

We have enjoyed our time with you and learned a lot that will greatly help us.

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VITA
Susan Aguiñaga, MS
Curriculum Vitae
May, 2016

A. EDUCATION:

Enrolled in Doctor of Philosophy Program

Fall 2012-Summer 2016

University of Illinois at Chicago

Major: Kinesiology, Nutrition, and Rehabilitation Sciences

Emphasis: Exercise Psychology

Advisor: Dr. David X. Marquez

Master of Science

May 2012

University of Illinois at Chicago

Major: Kinesiology

Emphasis: Exercise Physiology

Advisor: Dr. David X. Marquez

Bachelor of Science

May 2010

University of Illinois at Chicago

Major: Kinesiology

Minor: Nutrition

B. RESEARCH EXPERIENCE:

LUCID: Latinos Unique scenario, Cognitive Impairment addressed via Dance

(Rush University Alzheimer's Disease Center and UIC Department of Kinesiology and Nutrition Funding, PI: David X. Marquez)

Role: Project Coordinator/Research Assistant

Fall 2014-present

Assist with study design, IRB materials, translation of recruitment materials, screening, data collection, assess program fidelity, data processing and analysis, and manuscript preparation for a study that examines the feasibility of implementing the BAILAMOS© program in older Latinos with mild cognitive impairment.

BAILA: Being Active, Increasing Latinos' Healthy Aging

(National Institute for Nursing Research, 1 R01 NR01315101 PI: David X. Marquez)

Role: Research Assistant

Fall 2011-present

Assist with training of personnel, translation of recruitment materials, recruitment, screening, testing, and data collection for a randomized-controlled trial that tests the impact of the revised

BAILAMOS© program on lifestyle physical activity, self-efficacy, and health outcomes at 4 months and BAILAMOS© maintenance activities at 8 months.

Physical Activity and Health of Latinos

(UIC Department of Kinesiology and Nutrition Funding)

Role: Principal Investigator

Fall 2011-Fall 2012

Designed and conducted a cross-sectional study that examined the physical activity levels among middle-older aged Latino food service workers, and examined how physical activity and occupational physical activity relates to health outcomes.

BAILA-C: Bypassing Alzheimer's, Increasing Latinos' Activity and Cognition

(Alzheimer's Association, New Investigator Research Grant to Promote Diversity, PI: David X. Marquez)

Role: Research Assistant

Fall 2011-Fall 2013

Assisted with translation of recruitment materials, recruitment, screening, testing, and data collection for a randomized-controlled trial that examined the impact of the revised BAILAMOS© program on quality of life, lifestyle physical activity, and physical and cognitive function of older Latino adults.

Translation of Fit & Strong! for Older Latinos

(Midwest Roybal Center for Health Promotion and Translation Grant, PI: Susan Hughes)

Role: Research Assistant

Spring 2011

Assisted with translation of recruitment materials for a study that tested the implementation of the Fit and Strong! program among older Latino adults with arthritis.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

Concept Paper: Examining Barriers to WIC Retention Among Children

(United States Department of Agriculture (USDA) Grant, PI: Angela Odoms-Young)

Role: Research Assistant

Spring 2011

Assisted with IRB materials, translation of recruitment materials, and data collection for a study on the barriers and facilitators towards child participation in WIC.

Project WEL: Walking & Environment in Older Latinos

(Midwest Roybal Center for Health Promotion and Translation Grant, PI: David X. Marquez)

Fall 2010

Role: Research Assistant

Assisted with recruitment of participants, translation of recruitment materials, data collection, conducted environmental audit, and manuscript preparation for a study that identified the barriers and facilitators to walking/physical activity among older Latinos.

BAILE, Boosting Activity in Latino Elderly

(Midwest Roybal Center for Health Promotion and Translation Grant, PI: David X. Marquez)

Role: Research Assistant

Fall 2009-Spring 2010

Assisted with the translation of recruitment materials, recruitment, screening, and testing of participants, and data collection and entry for a randomized-controlled trial that tested the revised 4-month BAILAMOS[®] program in sedentary older Latinos who are overweight/obese.

BAILAMOS© Balance & Activity In Latinos: Addressing Mobility in Older adults

(UIC Department of Kinesiology and Nutrition Funding, PI: David X. Marquez)

Role: Undergraduate Research Assistant

Fall 2009-Spring 2010

Assisted with translation of recruitment materials, recruitment, screening and testing of participants, data collection and entry, and manuscript preparation for a single group pilot examining the feasibility and impact of the BAILAMOS Latin dance program for older Latinos.

Perceptions of Dance among Latinos

(UIC Department of Kinesiology and Nutrition Funding, PI: David X. Marquez)

Role: Undergraduate Research Assistant

Summer 2009

Assisted with focus group sessions, and analyzed transcribed data for a study on the perceptions of dance among older Latinos.

C. TEACHING EXPERIENCE:**Guest Lecturer- KN 335 Exercise Psychology**

University of Illinois at Chicago; Department of Kinesiology and Nutrition

Fall 2013 & Fall 2015

Taught lectures that focused on physical activity, depression, anxiety, and self-efficacy

Teaching Assistant-KN 335 Exercise Psychology

University of Illinois at Chicago; Department of Kinesiology and Nutrition

Fall 2011, Spring 2012 & Spring 2013

Attended lectures, learned course material, held office hours, graded assignments and examinations, and proctored examinations.

Teaching Assistant-KN 472 Movement Neuroscience

University of Illinois at Chicago; Department of Kinesiology and Nutrition

Spring 2012, Fall 2012 & Spring 2013

Primary responsibilities included grading assignments and examinations, holding office hours, and proctoring examinations.

Teaching Assistant-KN 372 Motor Control and Learning

University of Illinois at Chicago; Department of Kinesiology and Nutrition

Fall 2012 & Spring 2013

Primary responsibilities included grading assignments and examinations, holding office hours, and proctoring examinations.

Teaching Assistant-KN 100 Kinesiology and Nutrition First-year Seminar

University of Illinois Chicago; Department of Kinesiology and Nutrition

Fall 2011

Assist with general course maintenance such as grading, attendance, record keeping, and student communication.

D. BOOK CHAPTERS

Marquez, D.X., **Aguiñaga, S.**, Vasquez, P., Marques, I., & Martinez, M. (In Preparation). "Physical activity interventions in Latino populations." In Physical activity in diverse populations: Examining the evidence and strategies for practice (Melissa Bopp, Editor). Taylor and Francis, London.

E. ARTICLES IN REFEREED JOURNALS

Marquez, D. X., Bustamante, E. E., & **Aguiñaga, S.** & Hernandez, R. (2015). BAILAMOS[®]: Development, pilot testing, and future directions of a Latin dance program for Older Latinos. *Health Education & Behavior*. doi: 10.1177/1090198114543006.

Marquez, D. X., **Aguiñaga, S.**, Campa, J., Pinsker, E., & Bustamante, E. E., & Hernandez, R. (2014). A Qualitative Exploration of Factors Associated with Walking and Physical Activity in Community-Dwelling Older Latino Adults. *Journal of Applied Gerontology*. doi: 10.1177/0733464814533819

Marquez, D.X., Wilson, R.S., **Aguiñaga, S.**, Vasquez, P., Fogg, L.F., Yang, Z., Wilbur, J., Hughes, S., & Spanbauer, C. (In review). Regular Latin dancing and health education may improve cognition of older Latinos.

F. MANUSCRIPTS IN PREPARATION

Aguiñaga, S. & Marquez, D.X. (In preparation). Feasibility of a Latin dance program among older Latinos with mild cognitive impairment.

Aguiñaga, S., & Marquez, D.X. (In preparation). Can a Latin dance program impact physical activity, fitness, and sedentary behavior?

Aguiñaga, S., Lamar, M., Wang, E., Hughes, S., Odoms-Young, A., & Marquez, D.X. (In preparation). Can older Latinos with mild cognitive impairment benefit cognitively and physically from a Latin dance program? A randomized controlled study

Aguiñaga, S., Holloway, S., Wilbur, J., Hughes, S., Wilson, R.S., Fogg, L.F., & Marquez, D.X. (In preparation). Physical activity changes in older Latinos after participation in BAILAMOS.

Aguiñaga, S., & Marquez, D.X. (In preparation). Physical activity and health of middle- and older-aged Latino food service workers.

Marquez, D.X., Wilcox, S., Griffith, M., Janicek, S.J., & **Aguiñaga, S.** (In preparation). Perceptions and beliefs about the role of physical activity and nutrition on brain health in older Latinos.

Marquez, D. X., Whitt-Glover, M. C., **Aguiñaga, S.**, Hughes, S., & Wilbur, J. (In preparation). Interventions with older Latinos: Challenges and a cultural paradigm to address the challenges

G. REFEREED PRESENTATIONS:

Aguiñaga, S., Fogg, L.F., Wilbur, J., Hughes, S.L., Marquez, D.X. Influence of Latin Dance on

Objectively Measured Physical Activity among Older Latinos. Symposium to be presented at the annual meeting of the American College of Sports Medicine (ACSM), Boston, Massachusetts, May 2016.

Aguiñaga, S., & Marquez, D.X. Impact of a Latin dance program on sedentary behavior among

Older Latinos with mild cognitive impairment. Poster presented at the annual Recognition for Achievement, Research & Excellence (RARE) event at the University of Illinois at Chicago, April, 2016.

Aguiñaga, S., Marques, I.G., Griffith, M., Janicek, S.J., Wilcox, S., Marquez, D.X. Older

Latinos' Perceptions of Cognitive Health and the Role of Physical Activity and Nutrition. Symposium presented at the annual meeting of the Society of Behavioral Medicine, Washington, DC, March, 2016.

Vasquez, P., **Aguinaga, S.**, Wilson, R.S., Fogg, L.F., Wilbur, J., Hughes, S., & Marquez, D. X.

Influence of Latin Dance on Physical Activity Among Community Dwelling Older Latino Adults. Poster to be presented at American Heart Association| American Stroke Association- EPI Lifestyle 2016, Phoenix, Arizona, March 2016.

Aguinaga, S., Vásquez, P., Logsdon, R., Marquez D.X. Sedentary Behavior, Depression, and

Weight Status among older Latinos with Mild Cognitive Impairment. Poster presented at the Sedentary Behavior and Health Conference at the University of Illinois at Urbana-Champaign, October, 2015.

Marquez, D.X., Caceres, M., **Aguinaga, S.**, Vasquez, P., & Janicek, S.J. Lessons learned in

conducting health-related randomized controlled trials with older Latinos. Symposium presented at the annual meeting of the Gerontological Society of America, Washington, DC, November, 2014.

Aguinaga, S. Vásquez, P., Wilson, R.S., Fogg, L.F., Wilbur, J., Hughes, S., & Marquez. Influence of Latin Dance on Mobility and Physical Activity among Older Latinos. Poster presented at the National Institute on Aging Resource Centers for Minority Research (RCMAR) Gerontological Society of America Preconference, Washington, DC, November, 2014.

Aguinaga, S., Wilson, R.S., Fogg, L.F., Wilbur, J., Hughes, S., & Marquez. Influence of Latin

Dance on Mobility among Older Latinos. Poster presented the annual meeting of the Gerontological Society of America, Washington, DC, November, 2014 and presented at the Cells to Community graduate event at the University of Illinois at Chicago, September, 2014.

Aguinaga, S., Vásquez, P., Wilson, R.S., Fogg, L.F., Wilbur, J., Hughes, S., & Marquez. Latin

Dance and Health Education: Influence on Cognitive Function. Poster presented at the annual meeting of the Society of Behavioral Medicine, Philadelphia, PA, April, 2014 and presented at the International Conference on Aging in the Americas, Boulder, CO, September, 2014.

Vasquez, P., **Aguinaga, S.**, Wilson, R.S., Fogg, L.F., Wilbur, J., Hughes, S., & Marquez, D. X.

Increasing Physical Activity among Older Latino Adults. Poster presented at the International Conference on Aging in the Americas, Boulder, Colorado, September 2014.

Aponte-Soto, L., Castillo, A., Hernandez, R. **Aguinaga, S.** Improving Health of Latino Elders:

Lessons Learned from Chicago-based Health Interventions. Panel discussion presented at seventh annual Health Disparities and Social Justice Conference, Chicago, IL, February 2014.

Marquez, D. X., Whitt-Glover, M. C., & **Aguinaga, S.** Interventions with older Latinos: Challenges and a cultural paradigm to address the challenges. Panel Discussion presented at the annual meeting of the Society of Behavioral Medicine, San Francisco, CA, March, 2013.

Bustamante, E.E., **Aguinaga, S.**, Bevan, J. Physical Activity Intervention in Older Latino Adults: Processes, Challenges, and Opportunities. Symposium presented at the Midwest American College of Sports Medicine (MWACSM) Regional Meeting, Oregon, OH. November, 2012

Aguinaga, S. Campa, J., Pinsker, E., Bustamante, E.E., Marquez, D.X. Built Environment Influences on Walking in Older Latinos. Poster presented at the annual meeting of Society of Behavioral Medicine, New Orleans, LA, 2012.

Marquez, D. X., Bustamante, E. E., & **Aguinaga, S.** Development and pilot testing of the BAILAMOS[®] dance program and its impact on physical and cognitive function in older Latinos. Paper presented as part of symposium at the annual meeting of the Gerontological Society of America, Boston, MA, November, 2011.

Marquez, D.X., Bustamante, E.E., **Aguinaga, S.**, Wilbur, J., & Mendez, M. Feasibility and Impact of a Latin Dance Program on Self-Reported Physical Activity and Quality of Life among Older Latino Adults. Poster presented at the annual meeting of the Society of Behavioral Medicine, Washington, DC, 2011.

Bustamante, E. E., **Aguinaga, S.**, Mendez, M., & Marquez, D. X. (2011). Comparison of Physical Activity Characteristics between Four Styles of Latin Dance among Low-Active Older Latinos. Poster presented at the annual meeting of the American College of Sports Medicine, Denver, CO, 2011.

Marquez, D. X., Bustamante, E. E., **Aguinaga, S.**, Wilbur, J., & Mendez, M. Creation and impact of a Latin dance program on self-reported physical activity and enjoyment among older Latino adults. Poster presented at the annual meeting of the Gerontological Society of America, New Orleans, LA, 2010.

H. AWARDS AND HONORS

FASEB MARC Program Poster/Oral Presentation Travel Award

May 2016

Federation of American Societies for Experimental Biology (FASEB)/ Maximizing Access to Research Careers (MARC) Program

Award is a component of a federal grant from the Minority Access to Research Careers Program of the National Institute of General Medical Sciences.

Level 2 Participant in ACSM Leadership and Diversity Program

2012-2015

American College of Sports Medicine

Program that mentors and retains minority members by requiring ACSM membership, involvement in ACSM meeting (regional and national) and committees, and pursuit of ACSM professional presentations, publications and fellowship.

Chancellor's Student Service and Leadership Award

Spring 2010 & 2015

University of Illinois at Chicago

Award that recognizes outstanding student leaders who, while maintaining high academic achievement, demonstrate a commitment to the UIC community

Diversifying Higher Education Faculty in Illinois Fellowship Program

2013-2014

Illinois Board of Higher Education

Program that aids students to complete graduate degrees leading to a faculty or staff position at Illinois higher education institutions

Department of Kinesiology and Nutrition Funding

Spring 2013, Spring 2014, & Spring 2016

University of Illinois at Chicago

Funding to assist graduate students presenting research at national conferences in meeting travel-related expenses

Travel Award

Spring 2011, Spring 2014, Fall 2014 & Fall 2015

University of Illinois at Chicago Graduate Student Council

Award to assist graduate students presenting research at national conferences in meeting travel-related expenses

HCOE Pre-Medical Health Disparities Summer Research Program

Summer 2011

University of Illinois at Chicago

A ten week paid fellowship that provides skill sets to prove a hypothesis, understand preliminary data and findings, and understand the outcomes of research, application and its importance in the medical field

Department of Kinesiology and Nutrition Funding

Fall 2011

University of Illinois at Chicago

Funding to conduct master's project

Level 2 Participant in Midwest ACSM Mentoring and Leadership Program

October 2010-October 2011

Midwest American College of Sports Medicine

Program designed to provide a meaningful mentoring relationship aimed at guiding, advancing and inspiring individuals navigating their professional careers.

Medicina Scholars Program Award

Spring 2008

Hispanic Center of Excellence at the University of Illinois at Chicago

Award given to students who complete a three year program designed to introduce Latino scholars to the medical profession

I. CERTIFICATIONS AND TRAININGS

Advanced Research Course on Physical Activity and Public Health

July 27-August 1, 2015

National Institute of Public Health of Mexico, Cuernavaca, Morelos, Mexico

Collaborative Institutional Training Initiative Program

June 2009-present

University of Illinois at Chicago

HSPP 105 HIPPA On-line Training

September 2015-present

University of Illinois at Chicago

American Heart Association/Emergency Care & Safety Institute

November 2011-present

University of Illinois at Chicago

Certified in CPR, AED, and First Aid

Certificate of Completion as a Medical Interpreter

December 2004-present

Waubonsee Community College

J. LANGUAGES

English (native)
 Spanish (excellent reading, writing and conversational)

K. PROFESSIONAL SOCIETIES

Gerontological Society of America (GSA)
 2013-present

American College of Sports Medicine (ACSM)

Fall 2010-present

Society of Behavioral Medicine (SBM)
 March 2011-present

L. PROFESSIONAL SERVICE**Program Committee Member**

March 2016-present

Society of Behavioral Medicine, 38th Annual Meeting & Scientific Sessions

Ad-hoc Reviewer

2016

The Gerontologist

Board Member

May 2013-May 2016

University of Illinois at Chicago, Latina/o Graduate Student Association

Member

December 2012

University of Illinois at Chicago, Search Committee of Visiting Research Specialist

Student Representative

Summer 2011

University of Illinois at Chicago, Diversity Strategic Thinking and Planning Initiative
 Campus-wide effort to make diversity foundational to all of the colleges and campus units

M. CONFERENCES ATTENDED

International Conference on Aging in the Americas
 September 2014

Alzheimer's disease: Translating Research into Care
June 2014

DePaul Health Disparities and Social Justice Conference
February 2014

Gerontological Society of America
October 2013-2015

Pan American Health Organization and Healthy
October 2011

Aging Network Meeting

Reshaping Chicago Together: A Citywide Summit

July 2011

American College of Sports Medicine
June 2011-2015

Society of Behavioral Medicine
April 2011-2016

UIC Minority Health in the Midwest Conference
February 2011-2014

Midwest ACSM Annual Meeting
October 2010-2013

IOM- UIC Midwest Conference on Diabetes and Obesity
September 2010

N. REFERENCES

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