Research Article

A Cardiovascular Health Program for Latinos Supplemented with Pedometers

Tara Trudnak, Angela Lloyd, Wayne W. Westhoff, and Jaime Corvin

ABSTRACT

Background: *Physical inactivity is an important modifiable risk factor for many chronic diseases which disproportionately affect Latinos in the U.S. Targeting at-risk Latinos for prevention and intervention programs to increase physical activity can help decrease their risk for developing these diseases.* ***Purpose:*** *The purpose of this study was to promote physical activity, while measuring and monitoring behavior change associated with pedometer use among Latinos. The study's objectives were to: (1) promote physical activity and increase awareness of the importance of walking and exercise through the use of pedometers, (2) calculate the amount of pedometer steps each participant takes over a period of time, and (3) determine whether the use of pedometers along with education about exercise in a cardiovascular disease program would increase participant's physical activity.* ***Methods:*** *Prior to starting the program, participants were given a pedometer and a journal to track their steps.* ***Results:*** *The average number of steps participants took from the first to the last week of data collection increased significantly [F (188)= 6.20, P=0.014].* ***Discussion:*** *A pedometer may be a useful tool for health educators when combined with an evidence-based physical education program.* ***Translation to Health Education Practice:*** *This study is a demonstration of how health education responsibilities can be put into practice.*

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BACKGROUND

Inactivity and lack of adequate exercise is an enormous problem in the United States and is an important modifiable risk factor for many diseases, including obesity, cardiovascular disease, cancer and diabetes.[1] Many of these chronic diseases disproportionately affect Latinos in the U.S., making them an at-risk population.[2] Thus, targeting Latinos for prevention and intervention programs to increase physical activity and decrease risk for developing chronic diseases is vital to ensure optimal health.

Inactivity often results in obesity, a risk factor associated with a myriad of chronic disease conditions, including heart disease, stroke, diabetes, hypertension, elevated blood lipids, osteoarthritis and cancer.[3] While the prevalence of physical inactivity increased in the U.S. across all populations, minorities are the most likely affected[2]. In fact, it is estimated that over 57% of Hispanic women living in the U.S. are considered sedentary.[4] In a study investigating the prevalence of obesity from 1991 to 1998, the largest increases in obesity were found among Latinos, whose rate increased from 12% to 21% over the seven-year time pe-

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riod.[5] Prevalence estimates in 2005 indicated that at least one in four Hispanic adults was obese and more than one in six Hispanic school-aged children were overweight.[6] Latinos and their children have been greatly affected by the growing rate of inactivity and obesity in the U.S.

For many, walking is one of the easiest ways to become more physically active and help lose or maintain a healthy weight. Moderate forms of exercise, such as brisk walking for 30 to 60 minutes a day, has been proven to have significant physical and mental health benefits.[7] However, quantifying physical activity such as walking for the purpose of research or monitoring has been a challenge. Traditionally, physical activity is assessed using survey instruments, but recall bias is a major limitation in such studies. Thus, there is a strong interest in using more objective monitors such as pedometers to record physical activity. A pedometer, or step counter, is a small device that can be attached to a belt or waistband to detect lateral movement that occurs when a person steps (i.e., walking or running). Pedometers became popular for several types of physical activity research including clinical interventions, community-wide interventions and surveillance.[8] These devices are relatively inexpensive and provide immediate feedback to the user. Unlike accelerometers, pedometers do not measure the intensity level of the physical activity; but they count steps taken by the participant. However, they are more affordable ($10 - $50 per device) than accelerometers, which cost approximately $450 per instrument.[9] Pedometers have demonstrated validity and reliability and are considered an accurate measure of overall energy expenditure in ambulatory individuals.[7]

A meta-analysis by Richardson and colleagues[10] found that pedometer-based walking programs do help increase participants' step counts and physical activity and are associated with a modest decrease in weight. A meta-analysis by Bravata and colleagues[11] suggested that pedometers are associated with significant increase in physical activity and decrease in BMI and blood pressure. Several other studies showed pedometers themselves to be motivating devices that encourage physical activity, [4, 12, 13] although to what extent is unknown. Pedometers are effective in improving the physical activity of participants and studies indicate that they helped with reducing body weight,[4] blood pressure and cholesterol.[14] Additionally, walking and using a pedometer is affordable, safe for most people and can be easily worked into daily life.

Promoting walking through health education is common in many public health programs. However, Moreno and colleagues[15] found that some more conventional health education and disease prevention programs may not be as effective when used in the Latino community. Therefore, they suggested that programs take into account language preference and cultural values, as well as demonstrate how to make positive behavioral changes. Thus, implementing programs and conducting research with a community organization that works with Latinos and provides culturally competent health education is essential.

Pedometer studies involving Latino adults have focused on older adults.[16] low-income mothers[4] and low-income multiethnic women.[17] It is important to continue studies that assess physical activity specifically among Latinos to understand how health education programming and the use of pedometers can help motivate positive health behavior. This study will address a gap in the literature on physical activity programming and the use of pedometers among Latino participants.

PURPOSE

The purpose of this study was to promote physical activity and measure behavior change associated with the use of pedometers and cardiovascular health education curriculum among Latinos. The specific objectives of this study were to: (1) promote physical activity and increase awareness of the importance of walking and exercise through the use of pedometers, (2) calculate the amount of pedometer steps each participant takes over a period of time, and (3) determine whether the use of pedometers along with education about exercise in a cardiovascular disease program would increase participant's physical activity.

METHOD

University researchers collaborated with a community based organization (CBO) whose aim was to improve the health of the Latino community through community outreach and health education programs. All of the participants in this study were Latino participants in the evidence-based, CBO four week cardiovascular disease prevention program. The materials used in this program were based on the *Salud Para su Corazón* program which utilizes nationally recognized, culturally sensitive and language appropriate materials from the National Heart, Lung and Blood Institute.[18] This program has been shown to improve heart-healthy behaviors, promote community referrals and screenings and satisfy participants' expectations.[19]

The only inclusion criterion for recruitment into the cardiovascular disease program was that the Latino participant be at least 18 years of age at the time of the recruitment. The majority of participants were from inner city areas. Since the participants were currently enrolled in the cardiovascular disease prevention program, they all demonstrated an interest in education and improvement of their health. All discussions and materials from both the CBO program and the pedometer intervention program were in Spanish. On the first day of the CBO program, a member of the research team explained the pedometer intervention along with the informed consent process. Participants who consented to volunteer in the study received a pedometer and a journal to record their daily steps. Those who chose not to participate in the study continued the CBO program without involvement in the pedometer program. The research participants were given a comprehensive lesson on how to use the pedometer and track their steps. The participants were then asked to take their pedometers home and begin tracking their steps the following

day. Specifically, they were asked to: "Wear the pedometer on your waistband or belt as soon as you get dressed in the morning. Leave the pedometer on all day while you go about your normal daily activities. Take the pedometer off right before you go to bed. Open the pedometer to see how many steps you have taken throughout the day and write down the number of steps in your journal. Your journal has three weeks worth of days for you keep track of steps. Please do this *every day* for three weeks."

The New Lifestyles Digi-walker 200 series pedometer was used for this study based on its quality, simplicity and accuracy. With the 'Yamax original SW movement' technology, this pedometer did not need to be calibrated before use.[20] Several studies demonstrated the accuracy of New Lifestyle pedometers in measuring steps.[21-23]

Participants continued through the CBO program curriculum for a total of four meeting times over a three-week period. The first week was considered a baseline week for the participants so they were asked not to change any of their daily activities that week. At the second meeting all of the participants were educated on the importance of physical activity, given tips to increase physical activity, and were told about the Centers for Disease Control and Prevention's recommendation to walk 10,000 steps a day to obtain adequate daily physical activity.[24,25] On the last day of the program (after three weeks), participants were asked to submit their step journals.

Ethical Approval. The study protocol was approved by the university's Institutional Review Board.

Analysis. The data were analyzed using *SAS 9.1*[26]. The pedometer steps from each participant's journal were averaged for each of the three weeks. Pearson correlation coefficients were assessed and a repeated measures ANOVA was used to analyze the data and test for significant differences in the mean number of steps from one week to the next.

RESULTS

A total of 211 participants took part in this study. Approximately 62.2% of participants were female, a percentage comparable to the rate of female to male participants in the CBO program. All of the participants were Latino, the majority being of Cuban, Puerto Rican and Columbian ethnicity. Data were collected over two years.

The pedometer steps for individual participants were averaged for each week providing three sets of data, *Week 1, Week 2* and *Week 3.* The study analyzed whether or not participants were increasing their steps from week to week as well as from the beginning to the end of the CBO program. This analysis was conducted based on the assumption of normality, that all groups were independent (steps taken at different times) and sphericity (assuming the different variables have equal variance). The data sets appeared normal, each having absolute values of skewness and kurtosis of <1.0. The relatively symmetric shape of the distributions indicates that the means and standard deviations should provide adequate summaries of the central tendency and variability of the distributions. A Shapiro-Wilk test for normality was conducted and was not statistically significant, indicating that all of the distributions were relatively normal. Sphericity was adjusted for by modifying the degrees of freedom with an estimate of the sphericity parameter. A Greenhouse-Geisser adjustment[27] was used to estimate the sphericity parameter in this analysis.

The sample size, mean and standard deviation were calculated for the steps for each week, as well as the difference between the steps from week to week, as shown in Table 1. For example, "Gain 1-2" is the variable representing the amount of steps gained or lost from Week 1 to Week 2. Over the two year period, approximately 200 participants completed the step journals, however the sample size is different based on how many people completed all three weeks in the journal. Although participants set their own goals based on their current amount of physical activity, participants who obtained the recommended average of 10,000 per day were recorded. In Week 1, 24% of participants reached an average of 10,000 steps a day. Twenty-five percent and 31% of participants obtained an average of 10,000 steps a day in Week 2 and Week 3, respectively.

Table 2 provides the Pearson Correlation Coefficients for each correlation of the three weeks. All correlations were positive and show that there was a positive mean difference over time that is statistically significant. There tended to be a non-cumulative increase in steps from one week to the next. This indicates that as the participants used the pedometers they increased their steps.

Through repeated measures ANOVA, the change in pedometer steps from week to week were measured, as shown in Table

Table 1. Descriptive Statistics for Each Independent Variable

Variable	*N*	Mean	Participants who obtained an average of 10,000 steps per day
Week 1	211	7919	50
Week 2	204	8001	52
Week 3	193	8400	60
*Gain 1-2	200	68.62	-
**Gain 2-3	193	346.8	-
***Gain 1-3	189	423.4	-

*Gain 1-2 is the difference in means from Week 1 to Week 2
**Gain 2-3 is the difference in means from Week 2 to Week 3
***Gain 1-3 is the difference in means from Week 1 to Week 3

Table 2. Pearson Correlation Coefficients			
	Week 1	Week 2	Week 3
Week 1	1.0	0.707 ($P < 0.0001$)	0.736 ($P < 0.0001$)
Week 2	0.701 ($P < 0.0001$)	1.0	0.705($P < 0.0001$)
Week 3	0.736 ($P < 0.0001$)	0.705 ($P < 0.0001$)	1.0

3. Using the adjusted Greenhouse Geisser Epsilon p-value, the results of the analysis indicate that there was a statistically significant difference in the data sets, F(372.24)= 3.18, *P=0.043*. Follow-up contrasts indicated that there was no statistically significant difference between Week 1 and Week 2 steps, F(188)=.19, *P=0.666* or between Week 2 and Week 3 steps, F(188)= 3.54, *P=0.061*. However, there was a statistically significant difference between Week 1 steps and Week 3 steps, F(188)= 6.20, *P=0.014*.

DISCUSSION

In this study, a statistically significant difference was found between the average number of steps participants walked daily from Week 1 to Week 3. Results showed that participants walked more and were more physically active from the first week to the last week of the program. Health education regarding the importance of physical activity may be a contributing factor to this outcome in addition to the use of pedometers among Latino participants.

Discussions with the participant also indicated that having the pedometer as a tool to measure physical activity helped motivate them to continue or increase their daily activity and live healthier lives. A qualitative study is needed to better understand participant's perceptions of the pedometer and if and how it acts as a motivator to increase physical activity. In addition, follow-up research on these participants would help determine if in fact the pedometers were a motivation for physical activity after the cardiovascular program ended.

This study provided participants with a pedometer to increase their awareness of physical activity and helped promote healthy lifestyles. Participants were allowed to keep the pedometers for continued use and self-monitoring of their weekly physical activity level. Even if participants did not reach the CDC recommended 10,000 steps a day, many of them increased their steps and reached smaller goals they had set for themselves to increase physical activity. Findings from this study contribute to the literature on physical activity intervention programs among Latinos in an inner-city metropolitan area, a population that has been disproportionally effected by chronic diseases related to sedentary lifestyles. In addition, the data provide valuable exercise and lifestyle information to the cardiovascular program and the community based organization. Evidence-based, culturally appropriate programs such as the cardiovascular program, *Salud para su Corazón,* in combination with devices such as pedometers to track physical activity may be useful tools to improve health among this population.

Although we found that participants increased their steps it cannot be determined if the CBO program or the pedometers alone changed the behavior. The study tested the use of pedometers and the program simultaneously and therefore it can only make conclusions about this combined intervention. It may have been the health education or the pedometers alone, or a combination of the two interventions that caused participants to walk more. Further analysis on the effects of the education alone and additional qualitative responses from the participants about using the pedometer is needed to make further conclusions.

Although it was not part of these results, findings from a pre-test and post-test survey with the participants supported this study. Based on questions about attitudes, beliefs and behavior change, participants reported increasing physical activity and showed positive behavior change toward daily physical activity.

Limitations

The study can only make generalizations about the population from which we sampled, all of whom were Latino participants in the CBO program. A random sampling for the data collection was not used in the study; therefore, the findings are limited to only the participants in the program. The short time-frame is also a limitation as it cannot conclude long-term effects or continued use of the pedometers by study participants. However, a noted strength is the retention of the participants throughout the time period. It would be more difficult to obtain this retention rate if a pedometer study was conducted without a health education program and over a longer time period.

Future Steps

There are several areas in which future studies should focus. First, although it is difficult to track long-term behavior change, future studies could evaluate the use of pedometers over several months to assess whether the behavior change with pedometers are sustainable. Second, each participant is different and may set different personal goals in terms of increasing physical activity. Individual participants should be interviewed to determine if participants met their own personal goals. Last, focus groups could be conducted with Latino participants to better understand their perceptions of the pedometers and the cardiovascular disease prevention program, and how the pedometers may have served as motivators to increase physical activity. In addition, it is important to assess whether Latino participants believe the pedometers could be a long term solution to increase physical activity even after the program ended.

Table 3. Results of Repeated Measure ANOVA

Source	Degrees of Freedom	F- value	P-value	G-G P-value**
Overall Time	2 (376 error)	3.18	0.043*	0.043
Contrasts				
Week 1-Week 2	1 (188 error)	0.19	0.667	
Week2-Week 3	1 (188 error)	3.54	0.061	
Week1-Week 3	1 (188 error)	6.20	0.014*	

* $P < 0.05$
** G-G = Greenhouse Geisser Epsilon adjusted p-value.

TRANSLATION TO HEALTH EDUCATION PRACTICE

The Social-Ecological model's spheres of influence and cross-level effects validate the success of this program's translation from theory to practice. The influence of the individuals that participated in the program created a positive environment. Each individual could identify with the group through common language, culture, economic level and the desire to exercise and maintain a healthy lifestyle. The program's structure provided the freedom of social identify among the participants by establishing a time, location, setting and language conducive to reinforcing a sphere of positive influence. The cross-level effects also reinforced a positive experience. Evidenced-based material, university personnel and a formal environment of classroom setting with sign-in sheets are examples of the reinforcement of top-down effect. Combined with the bottom-up effect of the participants' eagerness to learn in a culturally appropriate setting and language, and the positive interactive effects created between the participants and health promoters translate into an encouraging health education outcome.

From a health educator's perspective, the translation of this research demonstrates the need for continuous monitoring of evidence-based programs to meet the needs of underserved populations through a combination of available tools. The pedometers brought added value to the program without compromising its integrity. When planning health education strategies, interventions and programs, this study demonstrates that appropriate and measurable program objectives must match the target population. For example, three weeks of recording steps may not appear to be theoretically sufficient; however, being sensitive to time consumption of volunteer participants who began the program with a desire to be motivated was paramount in combining an existing program with the insertion of the pedometers. The intended outcome of the study was achieved by assuring that no barriers to behavioral change existed nor was participant's overall satisfaction compromised by extending the health education program for the sake of research.

This study is a demonstration of how the seven areas of health education responsibilities can be put into practice. Initially, the needs of the Latino community were identified by the community based organization through databases, literature reviews, observation and the collection of qualitative and quantitative data over several years of working in the community, as well as in partnership with a university's school of public health. An evidence-based intervention program for Latinos was planned and implemented based on its criteria to meet the needs of the community. The intervention was developed to assure a valid and reliable evaluation through appropriate data-gathering methods and analysis. Through collaboration with community leaders, local health promoters were identified and trained to carry out the leadership and management of the program. The end result of the program was the establishment of the CBOs recognition in the community as a health education resource that has shown effectiveness in communicating and advocating for health of minority populations by integrating evidence based practices with new ideas and tools.

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