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A review of physical activity measures used among U.S. Latinos: Guidelines for developing culturally appropriate measures

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Abstract

As the U.S. population continues to grow and diversify, there is a need for progressive physical activity measurement and cross-cultural research. Studies suggest that U.S.-Latinos are among the most sedentary of ethnic groups compared to others; however, study findings may be biased given that some measures may not be culturally sensitive for assessing behaviors that are not characterized as leisure time physical activity. The primary objective of this review was to identify and evaluate measures used to quantify physical activity among U.S. Latinos. A review of the literature was performed and studies examining levels of physical activity among Spanish and English speaking Latinos were documented. This process involved identifying existing guidelines for the purpose of culturally adapting and/or translating [into Spanish] physical activity measures for the Latino population. These guidelines were used as the minimal criteria for the evaluation of the 13 identified measures of physical activity. Of these 13 measures, four were available in English and nine were available in Spanish. One English measure met the guidelines for being culturally adapted for assessing physical activity among Latinos. There were no Spanish measures that met all the guidelines for physical activity assessment among Spanish speaking Latinos. Lastly, the identified guidelines for developing culturally appropriate measures were improved to advance physical activity measurement among ethnic and cultural groups. Future research should merit the use of culturally appropriate guidelines to increase the understanding of physical activity patterns in the U.S.

Keywords

Physical activity measures; cultural translation and adaptation; Latino

I. Background/Introduction

The U.S. is experiencing an increasing prevalence of health conditions related to overweight and obesity. Obesity is a major cause for mortality and morbidity and it affects 30% of the U.S. population (among whom 60% are overweight) [1]. Being overweight or obese is a major risk factor for diabetes and cardiovascular disease (CVD) and both affect Latinos at disproportionate levels [2]. An estimated 2.5 million Latinos aged 20 years or older are diagnosed with diabetes; twice that reported for non-Latino whites [3]. Cardiovascular

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disease is the leading cause of death for people living with diabetes and it accounts for 31% of all Latino deaths [4]. Given that Latinos will comprise 24.5% of the U.S. population by 2050, the existing health disparities are pressing public health issues [5].

Physical inactivity is an independent risk factor for chronic disease and obesity. Given the low rates of physical activity among Latinos, public health interventions are heavily focusing on physical activity (PA) promotion in the Latino population [7]. Despite the diverse U.S. populace, PA measures have been developed for and validated in mainstream English speakers. For lack of measures developed for ethnic minorities, researchers have adapted and translated the available PA measures for English and Spanish speaking Latinos. Using health related measures that have been developed for the mainstream population [6] reduces the validity of past research for Latinos and limits the extent to which cross-cultural differences can be detected. Extending PA measurement to the Latino population is warranted so that researchers can make valid judgments about PA patterns of Latinos. Improving PA measures may increase the validity of PA studies and may provide better insight for designing effective PA interventions.

Assessing Physical Activity in Latinos

Data from the National Health and Nutrition Examination Survey (NHANES) and Behavioral Risk Factor Surveillance Survey (BRFSS) show a high prevalence of physical inactivity during leisure time among Latinos when compared to Non-Latino whites [7, 8]. According to the 2004 BRFSS, an estimated 40% of Latinos reported insufficient leisure time physical activity (LTPA) as compared with Non-Latino whites [9]. Multiple studies using PA measures have replicated the low prevalence of PA in Latino populations [7, 10, 11]. These studies suggest a consistent level of leisure time physical inactivity, or that measures have not been culturally adapted to assess other domains of PA among U.S. Latinos. Also worth mentioning is that PA measures in national surveillance surveys (i.e., NHANES, BRFSS, NHIS) have been validated with objective measures for Non-Latino whites [12, 13].

Past research may not consider cultural validity to determine how Latinos interpret “leisure time”. During implementation of NHANES III, Crespo and colleagues [7] found difficulties in measuring PA outside of leisure time among Latinos. Furthermore, PA is not always operationalized the same as PA measures do not consistently include incidental, transportation and occupational activities. This is an important consideration because modern household conveniences, transportation, and assembly-line type jobs decrease opportunity for LTPA in some subgroups [14]. While PA measures have been translated from English to Spanish for use in surveillance settings, there has been little to no cultural adaptation to account for cultural sensitivity and cultural differences between Latinos and Non-Latino whites [15]. Given that most measures are not open-ended, researchers are less able to discern culturally different patterns of PA across ethnic/minority groups. For instance, BRFSS results showed that using open-ended questions to assess types, intensities, and durations of PA results in different interpretations of PA among Latinos and African Americans respondents [8]. As a consequence, Latinos may be engaging in other forms of PA, such as occupational or household duties, that are not commonly assessed by LTPA measures. For this reason, cultural adaptation and tailoring are necessary and should go beyond linguistic appropriateness to allow consideration of other cultural-based behaviors that entail PA.

Cognitive processes and cultural perceptions may also introduce cultural bias in measures that aim to assess psychosocial correlates of PA. Ways in which measurement items are worded or organized may influence results as the questions may not have the same validity or reliability in the Latino population as in the mainstream American population. Less

acculturated Spanish speaking Latinos also are unable to distinguish beyond four levels of scale response, are confused by negatively worded items, and use extreme points of a scale more often than non-Latino whites [14, 23]. Cultural values and beliefs shared within Spanish speakers have shown that health is viewed as a token of good luck rather than a benefit of healthy behaviors [8]. In addition, interviews conducted with U.S.-born Latinos have demonstrated that Spanish speakers are less likely to report excellent or good health compared to more acculturated English speakers [16, 17]. For example, in an examination of the Hispanic Health and Nutrition Examination Survey, cross-tabulations were conducted between individuals' self-reported health and physicians' assessments for the same patients. Compared to physician assessment, analyses showed that Spanish speakers reported relatively poorer health compared to English speakers.

Baker and colleagues [22] found that patients with inadequate health literacy tended to rate their health as poor compared to those with adequate literacy. On the contrary, Latinos have the tendency to acquiesce when items are not understood or relevant [18]. Marín and Marín state that "yea-saying" (respondents agreeing with statements or questions regardless of their content) is a problem in data collection efforts among Latinos [18]. The issue of "yea-saying" may be related to low literacy and, in part, may explain why better-than-expected health related and morbidity outcomes are reported among some Latinos (a phenomenon known as the Hispanic Paradox). In 1992, one in five Americans was affected by low literacy resulting in the inability to read, understand and act on health information [20]. While Latino immigrants may have low literacy skills in English proficiency, they may also be affected by low literacy in Spanish [21]. As a consequence of low literacy, Latinos may not respond to self-administered measures reliably resulting in "yea-saying" as explained by Marín and Marín [18].

Culturally Appropriate Measures

The availability of culturally appropriate and valid measures of PA limit health promotion efforts among ethnic minorities. Physical activity has many facets (e.g. physical and social environments) in addition to different domains (e.g. leisure time, sports, occupational, housework, active transport, moderate- and vigorous-intensity), all of which make PA a challenge to measure, especially when making cross-cultural comparisons. A goal of PA measurement should be to maintain equivalence in PA assessments across cultures while being culturally appropriate and sensitive to assess and reduce health inequalities in subgroup populations. Measures should aim to keep constructs universal rather than too culture-specific for use in cross-cultural populations; however they should be modified according to linguistic appropriateness of a target population's reading and comprehension levels. Given the increasing number of Latinos immigrating to the U.S. researchers should consider the heterogeneity of the Latino population (e.g., Puerto Rican, Mexican, Guatemalan). Prior to translating measures intended for the mainstream population, formative research (e.g., focus groups, interviews) should be conducted with members of the target community to ensure that the content is culturally appropriate. Bilingual review and assessing readability can be performed to review the quality of adaptation for developing culturally appropriate measures [24–26]. For the most part, measures were intended for the general population; therefore, these mixed methods are recommended for increasing the performance of measures in culturally diverse groups. To maintain cultural relevance, culturally appropriate measures should consider the following social concepts:

- Shared norms: socially desirable behavior (e.g. "the do's and don'ts")
- Shared beliefs: ideas or assumptions about the world
- Shared values and expectations: moral standards perceived as desirable and esteemed

In addition to social concepts, Geisinger [24] and Sperber [25] recommend forward translation and adaptation by someone who is fluent in both languages (e.g., English and Spanish). The translator should possess a deep understanding of both cultures and expertise in characteristics and content that the measure aims to assess. Back-translation should be performed separately by a second individual and followed by an editorial review [25]. Both versions should be reviewed for equivalence in English and Spanish for validation of similarities in language and interpretability, and content should be adapted according to the reviewers' comments [24, 25]. Geisinger suggests pilot-testing in the target population prior to field testing for internal consistency and test-retest reliability analyses. Item-response theory can also be performed on the measure and all analyses should be compared to the corresponding results of the instrument in its original language. Lastly, a manual should be disseminated as well as other documents for a measure's professional use, translation, and adaptation.

High-quality PA measures should be consistent with cultural norms and language to minimize cultural bias. For this reason, the goal of this review was to identify and evaluate the quality of PA measures that have been administered to Latino groups. The measures were evaluated by how well they conformed to adaptation and translation guidelines for extending the use of English measures to Latinos. Due to lack of a gold standard, past research has included different approaches for developing culturally appropriate measures. As a result, the last aim of this review was to improve existing guidelines to guide and further advance the field of PA measurement.

II. Methods

Data Sources

To identify PA questionnaires that have been used in English and Spanish speaking U.S.-Latino populations, a Pubmed® search was performed using a combination of the following key words: culturally appropriate and sensitive, cultural sensitivity, adaptation, acculturation, guidelines, Latino, Hispanic, Mexican-American, physical activity, exercise, leisure, validity, measure, scale, instrument, survey, Spanish and translation. Emails were also sent to 16 Prevention Research Centers (PRC) focusing on Latino health and physical activity. The PRC's are funded by the Center for Disease Control and Prevention to conduct community based participatory research in the U.S. We requested any information or insight about measures of PA being used in the PRCs' Latino communities. For the resources obtained, authors were contacted to obtain a more descriptive approach in their translation and adaptation processes.

Selection Process

Primary selection was based on instruments (i.e., paper-based surveys and interviews, referred to here as measures) used in Hispanic/Latino populations to assess PA. Measures were included if they had been developed in English and culturally adapted to the Latino culture or if they had been translated into Spanish. The purpose of this sorting process was to assess the measure's level of cultural adaptation (English and Spanish measures) and translation (Spanish measures) to detect PA differences in the Latino population. Inclusion criteria for PA measures included their use in a Latino sample or in a study where Latinos were the largest subgroup. Measures were excluded if they had not been used to assess PA in Latino samples or if Latinos were not the majority of the sample (e.g., BRFSS with less than 10% of Latinos sampled [33].

Identifying Guidelines for Cultural Adaptation and Translation

A review of the literature identified cultural adaptation and translation guidelines based on the work of Sperber, Devellis, Boehlecke, and Geisinger [24, 25]. Given the following rationale, we used these guidelines as the minimum to evaluate successful approaches for culturally adapting and translating measures of PA for use among Latinos. The guidelines were disseminated to guide and improve the current methods [29–32] for PA measurement in diverse populations. In addition, these guidelines were established to maintain cultural sensitivity while adapting the International Physical Activity Questionnaire (IPAQ, www.ipaq.ki.se) into multiple languages for research purposes [27, 28]. The rigorous translation process of the IPAQ involved "forward translation" into Spanish by two native Spanish speakers. The translators were similar to the intended subgroup of the Latino community so as to maintain the same meanings. "Backward translation" back into parallel English was used to maintain conceptual and cultural equivalence, also performed by two different translators. Next, a review of the final version by all translators took place to achieve consensus and comparability in both versions [for cultural appropriateness]. Finally, the measure was pilot tested in a Latino community.

The IPAQ translation guidelines were first used in an international study designed to establish the validity and reliability of the IPAQ. A mixed-methods approach was used to translate and test the IPAQ in 14 centers in 12 countries [28]. Long and short forms were developed and assessed as self-administered or telephone interviews. The long IPAQ measures domains of PA (household, occupational, family care, transportation, moderate and vigorous) and inactivity. The short IPAQ measures moderate- and vigorous-intensity PA and inactivity only. Test-retest reliability using Spearman correlations were conducted in both forms to produce reliable items. Validity was established using content, concurrent and criterion-related validity checks. A strength in the development of the IPAQ includes comparison of self-report with the CSA model 7164 (Computer Science and Applications, Inc., Shalimar, FL) accelerometer measure of PA. Furthermore, qualitative feedback was collected and used to identify issues about interpretation of PA terms. For example, participants gave their definition of "a usual week" and distinguished between moderate- and vigorous-intensity PA. In addition, "pace" was not relevant in some cultures, and some participants inaccurately estimated 10 minute bouts of PA. The IPAQ differs from other PA questionnaires (i.e. BRFSS) as it measures multiple domains of activity (e.g., occupational, active transport) instead of only leisure time PA [24]. Although not a gold standard for assessing PA, the IPAQ emphasizes the importance of cultural equivalence (e.g., "responsibility" vs. "burden") and appropriateness to allow investigators to compare measures and results across cultures.

Scoring method for Spanish measures (translated and adapted)

To perform a systematic evaluation, the recommended six steps in the IPAQ guidelines were used to score the level to which various measures of PA that have been culturally adapted for use in the Latino population. The guidelines were obtained from the IPAQ page for cultural adaptation and translation (www.ipaq.ki.se). One point was given for meeting each of the six recommended guidelines of the IPAQ cultural translation process (summarized above). The points were summed for each measure and sorted from the highest to lowest in terms for meeting the IPAQ translation and cultural adaptation guidelines.

Scoring method for English measures (adapted, not translated)

English PA measures used among English speaking Latinos did not require translation; therefore the measures were evaluated by the last two IPAQ guidelines (#5 and 6) for accomplishing cultural adaptation. The points were summed for each measure and sorted from highest to lowest.

III. Results

Thirteen PA measures were identified as previously administered in English to Latino populations or previously translated from English to Spanish and administered to Latino populations (See Table 1). Nine questionnaires were obtained from peer-reviewed journals and/or the internet [28, 35–40], two were referred by PA researchers [34], and two questionnaires were obtained from individual researchers [41, 42].

The 13 PA measures were evaluated for the accuracy of cultural adaptation and translation (if applicable) using the recommended IPAQ guidelines. Among the 13 measures reviewed, all had been tested for one or more types of validity (construct, criterion, convergent, content, and expert validity) and had been published in peer-reviewed journals, with the exception of one measure (RAPA-Spanish). Measures that were translated into Spanish included sample testing and translation performed by English-Spanish bilingual speakers. All measures conceptualized PA differently, ranging from activities such as walking, exercise/aerobics, sports, jogging/running, household chores, and other LTPA. Some measures used intensity levels, such as moderate- and vigorous-intensity PA, to classify levels of PA performed while others expressed intensity using different terms. Four (Physical Activity Social Support and Self-Report Survey and the 7-Day Physical Activity Recall in English and Spanish) measures included questions about psychosocial correlates of PA in addition to PA assessments. Results for English measures are presented first and followed by the results for Spanish translated measures.

Evaluation of Measures Administered in English to Latino Populations

Four English language PA measures have been administered and evaluated in English speaking Latino populations (Rapid Assessment of Physical Activity [34], National Health Interview Survey Walking Supplement [35, 36], Physical Activity Social Support [37] and the 7-day Physical Activity Recall [38]) in four different studies (see Tables 1–2). Given that the questionnaires were administered in English, details of the translation process were not relevant; therefore the measure was evaluated for cultural adaptation by two guidelines (#5 and 6). One of the English measures met both of these guidelines.

Rapid Assessment of Physical Activity (RAPA)—The RAPA is a 9-item measure designed to allow clinicians to monitor physical activity levels in their older adult patients [34]. Of the 4 measures [34–38] administered to an English speaking Latino population, RAPA-*English* was the only measure that used both guidelines (#5 and 6) for cultural adaptation. Methods used to identify cultural appropriateness were focus groups and cognitive interviews with 22 older adults. The RAPA-*English* was also pilot tested in the older Latino adult population and correlated with body mass index [34].

Physical Activity Social Support (PASS)—The PASS was administered in English to a Latino population in the U.S. Women's Determinants Study [37]. The measure met one of the two IPAQ criteria [27] in that it was pilot tested prior to implementation with Latinos (guideline #6), however, it lacked review for cultural appropriateness (guideline #5). The PASS was pilot tested [37] in two ethnic minorities (Hispanic and non-Hispanic black) in addition to a white sample population. The pilot test occurred with middle- and older-aged minority women and also included structured personal interviews to assess social support. As noted by Eyler et al. [37], a limitation in their pilot study was that PASS was not developed to achieve a level of cultural competence. The PASS was developed for the English speaking population which is why it was difficult to generalize its use in minority subgroups and subcultures. Furthermore, the authors noted that the tool was not culturally

sensitive to social views and language barriers pertaining to those less acculturated, including immigrants [37].

National Health Interview Study (NHIS) walking supplement—The NHIS walking supplement did not meet any of the IPAQ translation guidelines as it was not reviewed for cultural relevance or pilot tested in a Spanish speaking population [35]. The supplement, however, was validated by Rauh et al. [37] who evaluated the test-retest reliability and validity with Caltrac (Hemokinetics, Inc., Madison, WI) accelerometers in a Latino population. The authors noted that the reliability of the NHIS walking supplement scores were minimal (r=0.31) and rated low in construct validity (r= −0.19–0.18), thus limiting the ability to assess moderate-intensity physical activities in Latinos [37]. Castro et al. [35] built on Rauh et al's [37] validity study by including the NHIS walking supplement questions in the *Self Report Survey* to investigate the psychosocial correlates of PA among ethnic minorities. The measure was not reviewed for cultural relevance nor was it pilot tested in the target population prior to determining PA prevalence [35]. Castro et al. concluded that collected data did not detect significant differences in psychosocial correlates or demographics within their total sample of ethnic minorities or when stratified by their studies intervention conditions [35].

7-Day Physical Activity Recall (PAR) [34]—The 7-Day PAR was administered to English and Spanish speaking Latinos in a culturally appropriate PA intervention. The English version of the 7-Day PAR administered to English speaking Latinos did not meet any of the criteria for being culturally sensitive to Latino culture. The published source did not mention if the measure was pilot tested or reviewed for cultural relevance in the Latino population [38]; however authors wrote that the measure was reliable and valid based on the study conducted by Rauh et al. [36]. Interestingly, the intervention was designed to be culturally appropriate such that materials and facilitators were bilingual; however formative research on cultural understanding of the measure was not conducted. Results for the Spanish 7-Day PAR will be discussed below.

Evaluation of Measures Administered in Spanish to Latino Populations

Nine Spanish PA [7, 14, 27, 38, 40–42] measures were identified using the aforementioned selection guidelines: translation from English to Spanish with PA assessment in Latino samples or Latino majority samples (see Tables 1–3). Using the IPAQ guidelines (#1–6) for cultural adaptation and translation, one of nine measures met all six recommended guidelines. Four of the measures met 4 or more of the 6 recommended guidelines, 2 measures met 3 of the recommended guidelines, and 2 measures met fewer than 3 of the recommended guidelines.

Measures that met 4 or more translation guidelines

The IPAQ [28], Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ) [39, 40], Voorrips et al. Physical Activity Questionnaire [41], and EPIC Physical Activity Questionnaire (EPAQ2) [42] met 4 or more of the recommended 6 cultural adaptation and translation steps prior to administration in Spanish speaking populations.

International Physical Activity Questionnaire (IPAQ) [28]—Following the IPAQ guidelines, the adapted IPAQ was translated into Spanish by three native Spanish speaking translators from Mexico, Puerto Rico, and Colombia (South America) for use in the National Physical Activity and Weight Loss Study [43]. A fourth translator then back-translated all versions and noted differences in terminology used between the Spanish language translations. The three translators agreed on the appropriate term to use for the U.S. Spanish speaking population to create the final Spanish IPAQ version, which was then back-

translated and evaluated for fidelity with the English language IPAQ version. This process met 5 of the 6 translation guidelines. The IPAQ was not pilot tested or validated in the U.S. Spanish speaking population before use in a national research study.

Modified Physical Activity Questionnaire (PAQ) [41]—The modified PAQ administered by Laffrey et al. was a modified version of Baecke's PAQ that conceptualized PA as cleaning, cooking, shopping, and leisure/sports [41, 44]. The modified PAQ was forward translated from English to Spanish and back-translated to English by native Spanish speaking translators. After forward and backward translation, the Spanish items were reviewed for cultural sensitivity by two bilingual Latinas from the target population. Item contents were reviewed for linguistic and content appropriateness. The process met 5 of the 6 IPAQ guidelines (# 1–5) but was not pilot tested prior to being administered in a Latina sample [41]. Women reported that they were more active than expected compared to previous literature that used more traditional measures of PA, such as sport and exercise [7, 45].

Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ) [39, 40]—The MLTPAQ was used to assess PA in the Spanish community of Minnesota. The measure was forward translated by fluent Spanish speakers but did not go through back-translation. The MLTPAQ was reviewed in Spanish and pilot tested for validity in male and female Spanish speaking residents. Cultural adaptation included a mixed-method by including/excluding forms of physical activity to maintain cultural relevance in the Spanish population. The process met 4 of the 6 guidelines (# 1, 3, 4, and 5). In its use in a Spanish speaking population, Elosua and colleagues found that 25% of their female population reported being a housewife where part of their day consisted of housekeeping activities [39]. Because of the process of cultural adaptation consisting of inclusion and exclusions of physical activities for this study's population, the MLTPAQ was effective in identifying housekeeping activities. These findings were consistent with findings reported for the EPAQ2 [42] discussed below; however findings were inconsistent with the NHANES III data evaluated by Crespo et al. [7].

EPIC Physical Activity Questionnaire 2 (EPAQ2) [42]—The EPAQ2 is a measure that includes items from the MLTPAQ and the Tecumseh Occupational Physical Activity Questionnaire and translated for use in a Spanish speaking population in Chicago, Illinois. The measure went through the processes of forward and backward translation performed by two individuals (a bilingual/bicultural doctoral student and a community member). The Spanish measure was reviewed by a group of bilingual/bicultural students; however it was not pilot tested in a Spanish speaking sample prior to implementation. The process met 5 of the 6 guidelines (# 1–5). The EPAQ2 operationalizes PA as *home activities* (e.g., modes of travel, TV, and video viewing, stair climbing and activities around the home), *activity at work* (e.g., kneeling and squatting, standing and sitting activities, stair climbing and travel to and from), and *recreation* (a wide range of activities). Marquez and McAuley were able to conclude gender differences in PA among Latinos and that acculturation may have accounted for differences in PA as reported in the measure [42]. The EPAQ2 was validated using accelerometry in a Latino community.

Measures that met 3 translation guidelines

The following measures (Lifestyles Behavior Questionnaire [46], RAPA-Spanish, and the 7-Day PAR-Spanish [38]) met half of the 6 recommended steps for cultural adaptation and translation prior to administration in Spanish speaking populations.

Lifestyles Behaviors Questionnaire (LBS)—The LBS [46], a modified version of the Health-Promoting Lifestyle Profile II, was forward translated from English to Spanish by a bilingual/bicultural translator and was reviewed in its Spanish form. The measure was not backward translated but it was derived from the HPLP II that did undergo forward and back-translations. The LBS met 3 of the IPAQ guidelines (# 1, 3, and 5). By using open-ended items to describe PA performed, Kim et al. found that participants were better able to define how they conceptualized PA (i.e., walking ranged from walking the dog, walking to pick up the children from school, going to the park and parking the car a good distance from an establishment) compared to predetermined descriptions of PA listed on the measure [46]. In addition to the types of PA performed, the LBS identified cultural barriers to PA, such as husband disapproval and limited time due to holding more than one job.

RAPA-Spanish—The RAPA-Spanish, was forward translated into Spanish by native Spanish speakers but was not back-translated into English. After forward translation, the measure was reviewed in Spanish and pilot tested with 13 Latinos (personal communication, J. LoGerfo, University of Washington, Prevention Research Center). Pilot test findings have not been reported. The measure met 4 of the 6 guidelines (1, 3, 5, and 6).

7-Day PAR- Spanish [38]—The 7-day PAR-Spanish was used in a culturally appropriate intervention evaluated by Poston et al. [38] and was administered to Spanish speakers in the target Latino community. The 7-Day PAR and psychosocial measures were forward and backward translated; however the measures were not reviewed or pilot tested for cultural appropriateness. The 7-Day PAR data did not show significant changes in PA and the intervention was unable to address barriers in the Latino community. Lastly, there were a limited number of trained bilingual interviewers and interrater reliability was not reported.

Measures that met 2 translation guidelines

The National Health and Nutrition Examination Survey III (NHANES III) and the Health-Promoting Lifestyle Profile II (HPLP II) met 2 of the IPAQ guidelines prior to use in Latino populations [6, 14].

NHANES III [6]—The NHANES III was translated into Spanish by the Public Health Service for use in U.S. health surveillance activities. Details used in the translation process are unknown except that items were translated from English to Spanish and administration has required bilingual interviewers. The measure met 2 of the 6 IPAQ guidelines (# 1 and 3).

HPLPII [14]—There is limited information about the translation process for the HPLP II except that it was forward translated into Spanish and backward translated into English. The measure met 2 of the 6 guidelines (# 1–2) and was used in a study of 71 community-residing Latinas aged 60 to 87 years of age. Findings from this study showed that 79% of the Latinas reported at least one activity in addition to their daily activities suggest that Latinas are more active than had been expected from the literature.

IV. Discussion

This review identified and evaluated the adaption and/or translation methods of measures that have been used to assess PA patterns of Latinos. A total of 13 measures were identified of which four had been used to assess PA in English-dominant Latinos and nine had been translated for use among Spanish-speakers. Using the minimal guidelines to evaluate the English measures, only one measure (RAPA) met the guidelines for being culturally appropriate for English-speaking Latinos, one measure (PASS) met half of the guidelines, and two measures (NHIS walking supplement and 7-Day PAR) did not meet any

recommended guidelines. Of the Spanish measures, four measures (IPAQ, PAQ, EPAQ2, MLTPAQ) met more than half of the guidelines for minimal translation and cultural adaptation, and three measures (HPLP-II, RAPA-Spanish, 7-day PAR) met less than half of the guidelines. Most of the Spanish translations (IPAQ, PAQ, EPAQ2, MLTPAQ, LBS, RAPA-Spanish, 7-Day PAR and NHANES III) had been forward translated by bilingual/bicultural translators, with the exception of the HPLP II (procedures were not specified). Also, some acronyms for PA measures were easy to remember (e.g., PASS) while others were not (e.g., HPLPII). The current review implicates a need to extend PA measurement to ethnically diverse populations using culturally appropriate methods. Advancing the field should involve the use of qualitative methods and pilot testing during the extension of measures in Latino or other ethnic minorities. Using a mixed-methods approach prior to implementing PA measures in target communities will increase the validity within and across ethnic minorities. Lastly, researchers should use easy to remember acronyms when developing measures so as to increase the dissemination of PA measures.

Maintaining the same meaning during the process of translation can be challenging. Furthermore, considering cultural relevance during adaptation and translation processes is important for establishing and increasing validity and reliability of PA measures in diverse populations. Four PA measures (*modified* PAQ, EPAQ2, MLTPAQ, and HPLP II) established reliability/consistency of items and/or validity of the tools in the Latino Spanish speaking population. The *modified* PAQ, the EPAQ2 and the MLTPAQ used criterion-related validity. The strength of the EPAQ2 is that accelerometry was used to establish validity of the measure in the Spanish speaking community. A weakness of the HPLP II is that less valid forms of measurement (i.e., expert, perceived health status) were used to establish validity. The IPAQ was evaluated for validity and reliability in a Spanish speaking population; however it was validated in rural Guatemala which does not make these findings relevant to Latinos living in the U.S. [28].

The instruments with the most rigorous of cultural adaptation and translation processes are likely to be the most sensitive in diverse populations; however this needs to be confirmed in subsequent studies. For example, the processes of cultural translation and adaptation may have increased the sensitivity of the MLTPAQ to detect an inverse association between energy expenditure in PA related to household and fitness that other PA measures failed to detect. Very active women may under-report low intensity PA, especially if they do not consider household chores as PA. For ethnic minority women, household PA may be an important form of daily activity and may represent activity at sufficiently vigorous levels to increase fitness. The *modified* PAQ was another measures that achieved a good level of cultural appropriateness; therefore it was better able to assess the number of Latino persons who reported regular exercise in comparison to the results from the BRFSS, a measure that did not undergo cultural adaptation (PAQ, 49% and BRFSS, 37%).

The lack of culturally appropriate measures limits research conducted in subgroup populations by restricting understanding of language and the intent of the measure. Published sources also failed to mention issues related to literacy in terms of how well the respondent understood the measures as presented. This is important to note given that low literacy is a concern for some Latino subgroups and other ethnic groups. Studies conducted in ethnic subgroups may not be appropriate to assess PA and psychosocial differences related to PA. Furthermore, interventions that are based on measures that are not culturally appropriate cannot be effective when they are informed by measures that are unable to detect differences in subgroup populations. To overcome measurement issues, a measure of PA also should consider low literacy and maintain a good level of linguistic and cultural competence to avoid bias in self-report and interview techniques as demonstrated by Laffrey et al. [41]. Having bilingual interviewers made it possible to conduct informal

conversational interviews with Latinas who interchanged between Spanish and English (a.k.a. “Spanglish”). In addition, by broadening the definition of PA, findings showed that 79% of women in this population participated in at least one form of PA and half were regular exercisers on a daily basis. These results were compared to 1997 BRFSS data which showed that only 37% of Latino persons in this age group exercised regularly.

It should be noted that the IPAQ guidelines may not be sufficient to reflect all of the processes needed to ensure cultural adaptation, translation and acceptability of PA measures in different cultures and languages; however, they are the minimum to achieve an adequate level of cultural appropriateness and achievable by persons not formally trained in the cultural adaptation of the survey instruments. Based on the results of this review, a deeper understanding of measurement adaptation and translation was gained by detecting the strengths and limitations of each measure. As we had no ultimate criterion to place culturally appropriate measures in context, we used the results of this review to improve the existing IPAQ guidelines. We developed a comprehensive set of guidelines for the purpose of reaching an optimal level of cultural appropriateness during PA assessment. An additional 7-steps pertaining to cognitive interviewing that are recommended for pilot testing. Based on pilot testing, other changes to the measure can be considered if necessary as long as the changes have the same interpretation.

To advance cultural competency in PA assessment, a modification of the IPAQ guidelines are presented below in answer sheet format for ease and use in Table 4. The modified guidelines include 13 steps to provide added detail for adaptation and translation methods. The use of these guidelines may help in achieving optimal cultural appropriateness of measures that will advance the quality of PA assessment in cultural and ethnic populations. Following these guidelines may provide enhanced validity for cross-cultural comparisons of PA across ethnic minorities in the U.S. population.

These steps should be used with qualitative research to assure that the measures are competent and appropriate to specific subgroups of ethnic populations. Qualitative research, such as focus groups and cognitive interviews, can improve cultural relevance of measures to gain a better understanding of correlates of PA among Latino immigrants [47]. Focus groups can help to address perceptions, values, benefits and barriers to PA and other health behaviors. They also provide a way to involve target community members in the research process and enhance understanding of the measure given the heterogeneity of the Latino population. Cognitive interviews can be used to show whether a population is interpreting survey items in the same way as the researcher [44]. Applying a mixed-methods approach is suggested for improving the performance of culturally appropriate assessment of health behaviors, such as PA, in ethnic minorities.

In summary, this review only evaluated self-report measures of PA using the IPAQ guidelines previously used in international research studies. Most measures lacked one or more of the IPAQ recommended minimal guidelines for cultural appropriateness. Few were validated to assure that activity patterns performed in leisure and/or non-leisure settings were relevant among Spanish speakers. Ideally, culturally relevant self-report measures should be evaluated for accuracy in the target population. Using focus groups, cognitive testing and objective assessment of PA patterns (e.g., direct observations of physical activity using trained observers [49, 50] or accelerometers worn by the participants) can provide culture-free measurement of PA as performed by Marquez and McAuley [42]. Additional guidelines are provided for culturally adapting and translating measures with more depth than provided by the IPAQ guidelines. Using culturally relevant measures to assess PA will contribute to future interventions and interpretation of research involving Latinos and ethnically diverse populations.

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Appendix

To better understand disparities related to health behaviors among ethnic minorities. For more information about developing or adapting culturally appropriate measures of PA, visit http://www.sdprc.org.

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Table 1

Description of Physical Activity Measures Administered to English and Spanish Speaking Latino Populations and Population Demographics

Name of Measure	Reference	PA Items	Sample Characteristics (n=, M/F, ethnicity)	Education/Literacy	PA Questionnaire Items	Method of Adoption	Survey Time
English PA Measures used among English-Speaking Latinos							
Rapid Assessment of Physical Activity (RAPA - English)	Topolski et al., 2006	Walking, stretching, yard work or vacuuming, aerobics, strength training swimming, stairs jog/run, tennis, racquetball	**Focus Groups** 24% Latino, 20% Vietnamese, 26% Chinese American, 26% white, and 4% black Male and Female 51–92 yo	6th grade reading level	15 items	Self-report, self-administered (exception of 2 participant assisted)	NS*
National Health Interview Survey (NHIS) Walking Supplement	Castro et al., 1999	Walking, PA psychosocial correlates (i.e., barriers, enjoyment, self-efficacy, social support)	**Self-Report Survey** N=128 100% Females 58 Hispanic 24–55 yo	6th gr. reading level; English Speaking	2 items	Self-Report; Trained interviewers	NS
	Rauh et al., 1992	Moderate and vigorous PA, flights of stairs, walking, sports and leisure time PA	**Rauh et al.** N=45 Bicultural Latinos 18–55 yo 53% Male, 47% Female Mean age 33 yo	High School	2 Items	Structured interview	NS
Physical Activity Social Support (PASS)	Eyler et al., 1999	Leisure time, lifestyle/ household chores, exercise, sports and social support for PA	N=2912 100% Females 660 Hispanic 40–70+ yo	NS	5 items	Telephone Survey	NS
7-Day PAR	Poston et al., 2001		N= 379 100% Hispanic Female 42% English Interviews Mean age 40 yo 57% less than high school	NS		Interview	NS
Spanish PA measures used among Spanish-Speaking Latinos							
International Physical Activity	Craig et al., 2003	Occupational, transport, Yard,	N= 155 77 Female, 78 Male 27 yo (sd= 5.3)	6.4–15.9	7 items (Short) 27 items (Long)	Telephone Survey (however piloted in Guatemala by personal interview)	NS

Name of Measure	Reference	PA Items	Sample Characteristics (n=, M/F, ethnicity)	Education/Literacy	PA Questionnaire Items	Method of Adoption	Survey Time
Questionnaire (IPAQ)		household, leisure, sitting	81% employed				
Modified Physical Activity Questionnaire (MPAQ)	Laffrey et al., 2000	Cleaning, cooking, shopping, leisure/sports	N=71 60–87 yo	NS	10 items	Mexican-American interviewer	NS
EPIC Physical Activity Questionnaire 2 (EPAQ2)	Marquez & McAuley, 2006	Home activities, activity at work, recreation	N=173 86 Female, 69 Male 18–60 yo 29 yo (sd=7.9) $15,000/less (61%)	40% 1–3 yr college or less	23 items (if 1 job) 46 items (if 2 jobs) + 1 matrix	Self-administered/Interview assisted	15–25 min
Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ)	Elosua et al., 2000; 1994	Dancing, walking, surfing, bowling, martial arts, household activities	N=250 18–40 y Middle-class	NS	63 items	Interview	10–20 min
Lifestyle Behaviors Questionnaire (Modified HPLPII)	Kim et al., 2004	Walking, parking far from destination, exercising, gardening, aerobics, jogging, swimming	N=256 6 Males, 250 Females Latino community	9±3 yrs	7 items	Lay health advisors	30–60 min
Rapid Assessment of Physical Activity (RAPA Spanish)	LoGerfo, J., personal communication	Light, moderate, vigorous PA (walking, stretching, yard work or vacuuming, aerobics, strength training swimming, stairs jog/run, tennis, racquetball)	13 Latino seniors	Low	9 items	Assisted Survey by Mexican interviewer	3–5 min
National Health and Nutrition Examination Survey III (NHANES III)	Crespo et al., 2001	Walking, running, small motor movements (exercising, gardening), heavy housework, heavy playing/ exercise, organized sports/ PE	N= 4893 2467 Male, 2426 Female Mexican-American	<12 y 3066 12 y 1023 >12 y 742	8 items (4 open-ended)	Trained bilingual interviewers	NS

Name of Measure	Reference	PA Items	Sample Characteristics (n=, M/F, ethnicity)	Education/Literacy	PA Questionnaire Items	Method of Adoption	Survey Time
Health-Promoting Lifestyle Profile II (HPLPII)	Hulme et al., 2003	Walking, parking far from destination, exercising, gardening, aerobics, jogging, swimming	N=540 228 Male, 312 Female 18–81 yo	NS	7 items	Translator assisted	NS
7-Day PAR	Poston et al., 2001		N= 379 100% Hispanic Female 58% Spanish/ Bilingual Interviews Mean age 40 yo 57% less than high school	NS		Interview	NS

[a]Not Stated

Table 2

Evaluating cultural appropriate measures (CAMs) in English and Spanish for English or Spanish-speaking Latinos

Name of Measure	Forward Translation (1 point)	Backward Translation (1 point)	Translators: Forward (1 point) Back (1 point)		Reviewed in Spanish/ English (1 point)	Pilot Tested (1 point)	Cultural appropriateness methods (1 point)	CAM Score (English: Total = 2) (Spanish: Total = 7)
English Measures used among English-Speaking Latinos								
Rapid Assessment of Physical Activity (RAPA)	N/A	N/A	N/A	N/A	N/A	Yes (Validity Study: N=115; 71% white, 20% black)	Yes (Part of focus groups)	2
Physical Activity Social Support (PASS)	N/A	N/A	N/A	N/A	N/A	Yes (N= 40; 100% female; 10 Latinas)	No Structured personal interviews	1
National Health Institute Survey (NHIS) Walking Supplement in Self-Report Survey	N/A	N/A	N/A	N/A	N/A	No	No	0
7-Day PAR	N/A	N/A	N/A	N/A	N/A	No	No	0
Spanish measures of PA used among Spanish-Speaking Latinos								
IPAQ (Spanish)	Yes	Yes	**Forward** Yes	**Back** Yes	Spanish	Yes	None	6
Modified Physical Activity Questionnaire (PAQ)	Yes	Yes	Yes	Yes	Spanish	NS *	Reviewed for cultural sensitivity via U.S.-Mexican-women	6
EPIC PAQ2 (EPAQ2) (Includes items from MTLPAQ and Tecumseh OPAQ)	Yes	Yes	Yes	Yes	Spanish	No	None	5
Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ)	Yes	No	Yes	No	Spanish	Yes	Inclusion/Exclusion of items not culturally appropriate	5
Lifestyle Behaviors Questionnaire (Modified HPLPII)	Yes	No	Yes	No	Spanish	NS	None	3
Rapid Assessment of Physical Activity (RAPA)	Yes	No	Yes	No	Spanish	Yes	None	3
7-Day PAR	Yes	Yes	Yes	NS	NS	NS	None	3
National Health and Nutrition Exam. Survey III (NHANES III)	Yes	No	Yes	No	NS	NS	None	2
Health-Promoting Lifestyle Profile II (HPLPII)	Yes	Yes	NS	NS	NS	NS	None	2

* Not Stated; N/A = Not applicable

Table 3

Validity and reliability of Physical Activity CAMs for English and Spanish-Speaking Latinos

Name of Measure	Validity (Type)	Reliability (Type) or Other	
English Measures used among English-Speaking Latinos			
Rapid Assessment of Physical Activity (RAPA)	**English:** Criterion (**Spearman**) with Community Healthy Activities Model Program for Seniors (r=.54, ρ <.001); Construct with Behavioral Risk Factor Surveillance System (BRFSS) and Patient-centered Assessment and Counseling for Exercise (PACE) (.52, ρ<.001);	Sensitivity: RAPA (84), BRFSS (73), PACE (81) PPV, NPV [a]: RAPA (73, 77), BRFSS (76,67), PACE (69, 70)	
Physical Activity Social Support (PASS)	**English:** Construct and concurrent criterion-related (Sallis et al., 1987)	Test-Retest (r= 0.55–0.86); Internal consistency (α= 0.61–0.91); Eigenvalues < 2 (Sallis et al., 1987)	
National Health Institute Survey (NHIS) Walking Supplement	**English:** Criterion with Caltrac monitor and 'significant other' interview; Construct with self-efficacy and barriers concepts	Test-retest by Rauh et al. (1992) Pearson: NHIS (r=0.31)	
Spanish measures of PA used among Spanish-Speaking Latinos			
IPAQ (Spanish)	**Spanish/English:** Concurrent (compared same day administered short and long forms); Criterion (CSA)	**Spanish (short form):** Test-retest: Spearman, 0.88 (urban); 0.25 (rural) **Spanish (long form):** Spearman, 0.85 (urban); 0.52 (rural)	
Modified Physical Activity Questionnaire (PAQ)	**English:** Concurrent (Blair 7d Recall); Construct (Stages of Change) **Spanish:** Content via U.S.-Mexican women	**English:** Test-Retest, r=0.89; Spearman, 0.78; Pearson, 0.72	
EPIC PAQ2 (EPAQ2) - Includes items from MTLPAQ and Tecumseh OPAQ	**Spanish:** Criterion (CSA); MLTPAQ items validated by Elosua et al. (2000 & 1994)	Not stated	
Minnesota Leisure Time Physical Activity Questionnaire (MLTPAQ)	**Spanish:** Criterion (maximal treadmill exercise test, electrocardiogram and systolic blood pressure)	Pearson: (exercise duration) Total EEPA (0.47) Heavy EEPA (0.43) Mod EEPA (0.14) Light EEPA (0.27) House EEPA (0.14)	Spearman: (Fitness) Total EEPA (0.39) Heavy PA (0.51) Mod EEPA (0.13) Light EEPA (−0.02) House EEPA (−0.30)
Lifestyle Behaviors Questionnaire (Modified HPLPII)	**Spanish:** Content (Expert)	**Spanish:** Internal consistency, α=0.77	
Rapid Assessment of Physical Activity (RAPA)	**Spanish:** Validation study in underway	Not available	
National Health and Nutrition Exam. Survey III (NHANES III)	Not stated	Not stated	
Health-Promoting Lifestyle Profile II (HPLPII)	**English:** Content (literature review, expert evaluation); Construct (factor analysis); Convergent (Personal Lifestyle Questionnaire); Criterion-related (perceived health status and quality of life)	**English:** Test-retest, r=0.89; Internal consistency, α=0.94, 0.79–0.87 **Spanish:** Internal consistency, α=.94	

[a] PPV= Positive Predictive Value, NPV= Negative Predictive Value

Table 4

Guidelines for making measures culturally appropriate

Recommended Steps for Translation (Palloni & Morenoff, 2001)	**Completed (Yes/No)**
1. "Translate all materials from the original English version."	
2. Use at least two independent forward translators to improve the quality of the instrument[1]. • Have translators, including those who speak different dialects if necessary, translate the survey and agree on the best translation.	
3. Review the translated measure in a group of bilingual people who are similar to the target population.	
4. "Have two different translators translate the new version back into English" (back-translation).[39] • There should be a back-translator for each forward translation. • The back-translators should reach a consensus on one translation and then consider revising after pilot testing.	
5. Have a group of bilingual people meet again to review the back-translation and decide on the final version.	
Cognitive Interviews Recommended Steps for Pilot Testing[a]	
For each item perform the following:	
1. Assess comprehension • Did you understand all of the words?	
2. Ask them to explain how they would answer the question • Talk out loud as you answer the question • Describe what you were thinking as you answer the question	
3. Assess clarity of question • What do you think is being asked? • What does this question mean to you? • Tell in your own words what you thought the question was asking	
4. Determine whether they need additional help in answering the questions such as definitions, examples, etc. • What types of examples might help other people understand this question?	
5. Ask them to describe how they would have asked this question to a sister or a friend • If you were asking this question to a friend or family member, how would you ask it?	
At the end of the survey, ask more general questions such as these:	
6. Did any of the questions make you feel uncomfortable? • Indicate whether the question is upsetting	
7. Were there activities that we missed?	
8. Would you prefer to have answers to pick from or do you prefer open answers?	

[a] Based on the information collected in the pilot testing, consider if other changes to the instrument are necessary.

Make only changes that do not change the meaning of the instrument.