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Associations between indicators of acculturation and tobacco dependence among Spanish-speaking Latino smokers

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Abstract

The current study utilized regression analyses to explore the relationships among demographic and linguistic indicators of acculturation, gender, and tobacco dependence among Spanish-speaking Latino smokers in treatment. Additionally, bootstrapping analyses were used to examine the role of dependence as a mediator of the relationship between indicators of acculturation and cessation. Indicators of time spent in the United States were related to indicators of physical dependence. Preferred media was related to a multidimensional measure of dependence. Gender did not impact the relationships between acculturation indicators and dependence. A multidimensional measure of dependence significantly mediated the relationship between preferred media language and cessation. Future research would benefit from consideration of acculturation and multidimensional measures of dependence when studying smoking cessation among Latinos, and from further examination of factors accounting for relationships among acculturation, dependence, and cessation.

Keywords

acculturation; tobacco dependence; Latinos; smoking cessation

1.0 Introduction

The adverse public health consequences of smoking among Latinos are severe, as three of the four leading causes of death among Latinos are smoking-related (i.e., cancer, heart

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disease, and stroke; Centers for Disease Control and Prevention, 2009). Further, lung cancer is the leading cause of cancer-related deaths among Latino men, and the second leading cause of cancer-related deaths among Latina women (American Cancer Society, 2009). Coupled with the fact that Latinos are the fastest growing racial/ethnic group in the United States (U.S.; United States Census Bureau, 2007), developing a better understanding of the determinants of tobacco dependence and cessation is vital to the prevention of smoking-related chronic disease in this population.

Although there is considerable within-group variability (Howe, Wu, Ries et al., 2006), Latinos as a group have among the lowest smoking prevalence rates of all racial/ethnic groups in the U.S. (Centers for Disease Control and Prevention, 2008). Additionally, Latino smokers tend to score lower on traditional indicators of tobacco dependence. Latinos are more likely to be non-daily smokers (Ackerson & Viswanath, 2009; Hyland, Rezaishiraz, Bauer et al., 2005; Trinidad, Pérez-Stable, Emery et al., 2009; Wortley, Husten, Trosclair et al., 2003; Zhu, Pulvers, Zhuang et al., 2007), they smoke fewer cigarettes per day (Bock, Niaura, Neighbors et al., 2005; Daza, Cofta-Woerpel, Mazas et al., 2006; Levinson, Perez-Stable, Espinoza et al., 2004; Trinidad et al., 2009), and they wait longer after waking before smoking (Daza et al., 2006) compared to non-Latino smokers. Despite their very different smoking patterns, very few randomized clinical trials of smoking cessation treatments have specifically targeted Latinos, and the few in existence demonstrate only modest overall effectiveness, with attenuating effects over time (Webb, Rodriguez-Esquivel, & Baker, 2010). A major impediment to advancing treatment efficacy among Latinos is that little is known about the processes underlying smoking cessation in this population (Fiore, Bailey, Cohen et al., 2000; Fiore, Jaén, Baker et al., 2008). Particularly understudied are the relationships between culturally relevant variables and critical determinants of smoking cessation such as tobacco dependence. The current study sought to address this gap by exploring the relationships among common indicators of acculturation, gender, tobacco dependence, and cessation among Spanish-speaking Latino smokers attempting to quit.

Acculturation refers to the behavioral and ideological changes experienced by individuals as a result of contact between two cultures (Berry, 1998, 2005), and includes an immigrant or minority individual's adoption of U.S. customs, values, and identification with U.S. culture. Within Berry's (2005) model of acculturation, most cultural adaptations resulting from the acculturative process, which Berry termed behavioral shifts, take place with little or no difficulty. When problematic acculturative issues arise that cannot be easily or quickly managed through behavioral shifts, this can result in a stress reaction, which Berry terms acculturative stress.

The adaptations an acculturating individual makes, or the coping response the individual has to acculturative stressors, may have implications for the relationship between acculturation and tobacco dependence. For example, studies have shown that more highly acculturated Latino smokers score higher on indicators of physical dependence compared to their lower acculturated counterparts (Marín, Pérez-Stable, & Marín, 1989; Palinkas, Pierce, Rosbrook et al., 1993). Palinkas and colleagues found that English-speaking Latino smokers were more likely to be heavy smokers (> 15 cigarettes per day) compared to Spanish-speaking Latino smokers (Palinkas et al., 1993). Marín and colleagues found that Latino smokers of high acculturative status (determined by dichotomizing scores on a short acculturation scale) smoked more cigarettes per day and waited less time before smoking their first cigarette of the day compared to their less acculturated counterparts (Marín et al., 1989). Within Berry's model, these increases in smoking severity with greater acculturation might be interpreted as a behavioral shift in response to exposure to different cultural norms regarding smoking.

Consistent with Berry's conceptualization of acculturative stress, associations between stressful experiences and acculturation are common among Latinos, although the direction of the association appears to differ according to the type of stressor. For example, higher acculturation is related to greater family conflict (Moyerman & Forman, 1992) but lower depressive symptomatology (Black, Markides, & Miller, 1998; Gallagher-Thompson, Tazeau, Basilio et al., 1997; Gonzalez, Haan, & Hinton, 2001; Gonzalez & Gonzalez, 2008; Masten, Penland, & Nayani, 1994; Torres & Rollock, 2007; Zamanian, Thackrey, Starrett et al., 1992). To the extent that acculturation influences important social/interpersonal factors that may be sources of stress, dependence on smoking may serve as coping mechanism among Latino smokers. Indeed, ample research and a prominent social-cognitive model of addiction highlight the major role of dependence and negative emotions in drug relapse (see Witkiewitz & Marlatt, 2004 for a review). Further, consideration of both the acculturative stress model and social-cognitive model of addiction may help explain recent findings on the relationship between acculturation and smoking cessation among Latino smokers (Castro, Reitzel, Businelle et al., 2009). In a sample of Spanish-speaking Latino smokers in treatment, Castro, et al., found high acculturation as measured by several demographic indicators predicted higher smoking cessation rates. Similar findings were recently reported among African Americans (Hooper, Baker, de Ybarra et al., 2012). Thus, in the case of smoking cessation, stressors associated with being of lower acculturative status may lead a greater likelihood of relapse.

A limitation of the extant research on acculturation and tobacco dependence (Bock et al., 2005; Marín et al., 1989; Palinkas et al., 1993) is that tobacco dependence was assessed with single dimension indicators of physical dependence, such as the number of cigarettes consumed per day, and the amount of time lapsed after waking before smoking the first cigarette of the day. Indicators such as these have been critiqued (see Piper, Piasecki, Federman et al., 2004) for their assumption that dependence can be fully captured with a single dimension reflecting the physiological manifestation of the dependence-tolerance process (i.e., smoking heaviness). Also, cigarettes per day and other single-item indicators of dependence may be too narrow a measure of a complex construct, and thus not adequately capture other non-physical aspects of dependence (e.g., cognitive and contextual variables; Piper et al., 2004).

For Latino smokers in particular, measures of cigarette consumption may suffer from floor effects, because Latinos tend to be low-level smokers (Trinidad et al., 2009; Zhu et al., 2007). Also, indicators of physical dependence are not consistent predictors of cessation among Latino smokers (Bock et al., 2005; Perez-Stable, Sabogal, Marin et al., 1991; Reitzel, Costello, Mazas et al., 2009; Woodruff, Talavera, & Elder, 2002). Thus, physical dependence indicators might be limited in their utility among Latino smokers. However, it is possible that dependence on smoking may be better captured through non-physical aspects of tobacco dependence, but this possibility has not been previously examined. Also, the influence of acculturative variables on non-physical aspects of dependence has not been examined.

To address the limitations of unidimensional indicators of physical dependence, multidimensional measures of tobacco dependence have emerged in recent years (e.g., Etter, Le Houezec, & Perneger, 2003; Piper et al., 2004; Shiffman, Waters, & Hickcox, 2004). For example, Piper and colleagues developed the Wisconsin Inventory of Smoking Dependence Motives (WISDM; Piper, Bolt, Kim et al., 2008; Piper et al., 2004), a theoretically informed measure of 13 motives that represent underlying mechanisms of dependence. Thus, it purports to improve upon unidimensional indicators of physical dependence with a multidimensional approach to assessing dependence that incorporates physical (e.g.,

tolerance, craving) and non-physical (e.g., affiliative attachment, automaticity) aspects of smoking.

Acculturation is also a multidimensional construct, consisting of factors relevant to language, behaviors, knowledge, attitudes/beliefs, and identity (Cabassa, 2003; Kim & Abreu, 2001; Kim, Laroche, & Tomiuk, 2001; Schwartz & Zamboanga, 2008; Unger, Ritt-Olson, Wagner et al., 2007). However, acculturation is often measured by a single factor, such as language fluency or nativity, that is assumed to represent overall acculturation (Guilamo-Ramos, Jaccard, & Turrissi, 2004; Thomson & Hoffman-Goetz, 2009; Unger et al., 2007). The limitations of such proxy measures have been detailed (Abraido-Lanza, Armbrister, Florez et al., 2006; Cabassa, 2003; Lara, Gamboa, Kahramanian et al., 2005; Nguyen & Meese, 1999; Unger et al., 2007), including that use of a single indicator of acculturation neglects the multidimensional nature of acculturation, thus limiting examination of how different aspects of acculturation might affect the same variable of interest differently. One way to address this issue when faced with single dimension proxies is to examine multiple indicators of acculturation. For example, use of indicators such as length of time in the U.S. may be a useful proxy for the amount of one's exposure to (and thus, familiarity with) mainstream societal practices. In contrast, indicators of language use may be a useful proxy for level of mainstream societal engagement (as opposed to mere familiarity), and language preference may be a proxy for identification (as opposed to mere engagement) with mainstream U.S. practices.

The current study sought to examine the relationship between multiple acculturation indicators and tobacco dependence among a sample of Spanish-speaking Latino smokers seeking cessation counseling. Both unidimensional and multidimensional measures of dependence were examined for relationships with gender and several indicators of acculturation. Consistent with previous research, and the conceptualization of increased smoking behavior as a behavioral shift, positive relationships between acculturation indicators and physical dependence indicators were expected. Relationships between acculturation indicators and a multidimensional measure of tobacco dependence, which includes non-physical aspects of dependence, were also examined. In line with the argument that stress associated with being of lower acculturative status may lead to greater dependence on tobacco, acculturation indicators and non-physical aspects of dependence were expected to be inversely related. Finally, mediation analysis was conducted examining tobacco dependence as a potential explanatory mechanism for the relationship between preferred media language and cessation found in previous work (Castro et al., 2009). Given an increased likelihood of cessation with increased acculturation, and that tobacco dependence decreases the likelihood of cessation (Kozlowski, Porter, Orleans et al., 1994; Piper, McCarthy, Bolt et al., 2008), it was predicted that greater preference for English-language media would be inversely associated with dependence, and lower dependence would in turn be positively associated with cessation. Finally, because previous research demonstrates an important moderating effect of gender on smoking prevalence (Bethel & Schenker, 2005) and cessation (Castro et al., 2009), the moderating effect of gender was examined.

2.0 Methods and Materials

2.1 Participants

The current study utilized data from a two-group randomized clinical trial that evaluated the efficacy of a culturally sensitive, proactive, behavioral treatment program for Spanish-speaking Latino smokers (detailed information about the clinical trial can be found in Wetter, Mazas, Daza et al., 2007). Eligibility criteria included 1) self-identification as a smoker; 2) calling the National Cancer Institute's Cancer Information Service (CIS;

1-800-4-CANCER) to request smoking cessation help in Spanish; 3) currently living in Texas, and; 4) at least 18 of age. Participants were recruited from several locations in Texas (e.g., Houston, San Antonio, El Paso, and the Rio Grande Valley) via paid media (television, radio, newspaper, and direct mailings).

Participants were enrolled from August 2002 to March 2004. There were 355 callers during the study period. Of the 355 callers, 297 consented to participate and were enrolled (84% participation rate). Of the 58 callers who did not participate, 28 declined, 3 were ineligible, 19 were unreachable, and 8 did not complete the baseline assessment.

2.2 Procedure

Callers who agreed to participate in the study were contacted by project staff within one week of their initial call to the CIS to complete a verbal, audiotaped informed consent and a baseline assessment. Participants were randomly assigned to receive one of two telephone-based counseling protocols as part of the clinical trial. Results of the clinical trial are available elsewhere (Wetter et al., 2007). With the exception of abstinence status, all variables examined in the current study were collected at the baseline assessment.

2.3 Measures and Variables of Interest

Abstinence—Smoking abstinence was defined as a self-report of not smoking during the previous 7 days at 12 weeks after the baseline assessment. “Abstinent” was coded “1” and “not abstinent” was coded “0”.

Acculturation indicators—Three indicators of acculturation that measure residence in the U.S. were used in the current study. Number of years in the U.S. was computed as the participant’s current age minus age of entry into the U.S. For individuals who were non-immigrants, age was used as the indicator of number of years in the U.S. Proportion of life spent in the U.S. was computed by dividing number of years spent in the U.S. by the individual’s age. Nativity, that is, whether the individual was an immigrant to the U.S. or U.S.-born, was also examined. Indicators of duration of residence in the U.S. are argued to be proxies for aspects of acculturation relevant to the amount of exposure to opportunities for cultural learning and adaptation (Thomson & Hoffman-Goetz, 2009). Number of years in the U.S. and proportion of life spent in the U.S. were continuous variables, whereas nativity was a dichotomous variable with ‘non-immigrant’ coded “1” and ‘immigrant’ coded “0”. Three indicators of acculturation related to language were also used in the current study: language spoken at home, language spoken at work, and preferred media language (i.e., the extent to which participants watched news and programs in English or Spanish). All language questions were rated on a five point scale. However, these five categories were collapsed into three categories because there were too few participants in some categories to make meaningful comparisons. The three categories were: “mostly/only Spanish,” “both with the same frequency,” and “mostly/only English.” Indicators of language use are argued to be proxies for functional or necessity-based cultural adaptation, whereas indicators of language preference may be proxies for cultural engagement or identification (Castro et al., 2009; Thomson & Hoffman-Goetz, 2009).

Demographics—Demographic variables included gender (male or female), partner status (partner or no partner), age, number of years of completed education, and annual household income.

Physical dependence—The number of cigarettes smoked per day and the amount of time lapsed after waking before smoking the first cigarette of the day were used as indicators of physical dependence. Time to first cigarette was coded as a dichotomous variable where

“5 minutes or less” was coded “1” and “6 minutes or more” was coded “0.” The total score of the Fagerström Test of Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker et al., 1991) was also examined as an indicator of physical dependence. This is a 6-item scale designed to measure dependence on nicotine, and has been found to be significantly related to biochemical markers of dependence as well as abstinence.

Wisconsin Inventory of Smoking Dependence Motives (WISDM; Piper, Bolt et al., 2008; Piper et al., 2004)—The WISDM is a 68-item inventory designed to assess the motivational domains that underlie tobacco dependence. Participants are asked to rate each item on a scale of 1 (“not at all true of me”) to 7 (“extremely true of me”). The WISDM consists of 13 subscales and a total score. The 13 subscales are organized into two overarching factors: Primary Dependence Motives (PDM: comprised of Automaticity, Loss of Control, Craving, and Tolerance) and Secondary Dependence Motives (SDM; comprised of Affiliative Attachment, Behavioral Choice/Melioration, Cognitive Enhancement, Cue Exposure/Associative Processes, Negative Reinforcement, Positive Reinforcement, Social/Environment Goads, Taste/Sensory Properties, and Weight Control). Piper et al. (2008) found that elevated PDM scores constitute a “necessary and sufficient” measure of dependence and are highly predictive of smoking cessation, while the SDM factor has less predictive utility.

2.4 Data analysis

A series of regressions were conducted to examine the main effects of gender and each acculturation indicator on number of cigarettes per day, time to first cigarette of the day, FTND, the individual WISDM subscales, the PDM and SDM factors of the WISDM, and the total WISDM score. Logistic regressions were conducted where time to first cigarette of the day was the dependent variable. All other dependence measures were continuous, thus linear regressions were conducted for these outcome variables. Analyses were adjusted for age, education, income, and partner status in order to isolate the effects of gender and acculturation indicators over commonly reported demographic influences. These covariates were entered in step 1 of each regression, and the main effects of gender and a specific acculturation indicator were entered in step 2. The interaction of gender with each acculturation indicator was also examined for each dependence indicator and was entered in step 3. Each combination of acculturation and dependence indicator was examined in a separate regression analysis.

Previous research (Castro et al., 2009; Hooper et al., 2012) identified a significant relationship such that greater levels of acculturation resulted in an increased likelihood of smoking cessation. Since lower dependence is also negatively associated with smoking cessation, acculturation indicators should be negatively associated with dependence in order for dependence to be a mediator of the relationship between acculturation and cessation. Thus, for the analyses that revealed logical relationships between dependence and acculturation indicators, dependence was examined as a potential mediator of the relation between that acculturation indicator and cessation. A bias-corrected bootstrapping procedure with 5,000 resamples was used to test indirect effects (Preacher & Hayes, 2008). This method is preferred over the traditional “causal steps” approach to examining mediation, as the causal steps approach is considered highly conservative and does not allow for overt statistical examination of the mediation effect, whereas the method used here provides a statistical estimate and significance test of the size of the actual indirect effect (Preacher & Hayes, 2008). Mediation analyses were additionally adjusted for gender and treatment group. All analyses were conducted using a sample of 297 individuals, where those with missing data were removed on a case-wise basis for a final sample of 287. Due to the exploratory nature of this study, no correction for multiple analyses was utilized.

3.0 Results

3.1 Participant characteristics

Participant characteristics by gender are presented in Table 1. Only one significant difference was found between men and women, with women more likely to have a household income of less than \$20,000 ($p = .014$). The ancestry or region of origin for the sample was as follows: 198 (66.7%) Mexican, 47 (15.8%) Central American, 36 (12.1%) South American, 10 (3.4%) Cuban, 3 (1.0%) Spaniard, 1 (0.3%) Puerto Rican, and 2 (0.7%) “other”.

3.2 Relationships among gender, acculturation indicators and physical dependence

Linear and logistic regression analyses were used to examine the effects of gender and acculturation indicators on FTND, number of cigarettes consumed per day, and time to first cigarette of the day. Results indicated no significant main effect of gender on any physical dependence indicator (results not shown). Additionally, there were no significant main effects of nativity or any language acculturation indicator on any physical dependence indicator (results not shown). However, analyses revealed a significant main effect of years in the U.S. and proportion of life in the U.S. on three indicators of physical dependence. Years in the U.S. was positively associated with number of cigarettes per day ($t [281] = 2.01$, $\beta = .14$, $p = .045$). Proportion of life spent in the U.S. was positively associated with number of cigarettes per day ($t [281] = 2.23$, $\beta = .14$, $p = .03$) and time to first cigarette (adjusted odds ratio [AOR] = 1.02, 95% confidence interval [CI] = 1.001-1.03, $p = .03$). There were no significant interactions of gender with any of the acculturation indicators predicting the physical dependence indicators (results not shown).

To visually depict the significant main effects, participants were divided into roughly equal quartiles of years in the U.S. and proportion of life in the U.S. Number of cigarettes per day and proportion of individuals smoking their first cigarette within five minutes of waking were calculated for each quartile. As depicted in Figure 1, cigarettes per day and proportion of individuals smoking their first cigarette within five minutes of waking increased with greater proportion of life in the U.S. Similarly, an increase in cigarettes per day was associated with spending more years in the U.S.

3.3 Relationships among gender, acculturation indicators and WISDM scores

As shown in Table 2, gender was significantly associated with only two WISDM subscales. Women scored higher on Positive Reinforcement, whereas men scored higher on Social/Environmental Goads. Analyses of effect of years in the U.S., proportion of life in the U.S., nativity, language spoken at home, and language spoken at work on WISDM scales revealed no significant effects. Greater preference for English-language media was related to decreased scores on PDM, SDM, and the WISDM total score (Table 2). This association was also significant for three of the four scales that comprise PDM (Automaticity, Craving, and Loss of Control), and five of the nine scales that comprise SDM (Affiliative Attachment, Behavioral Choice, Cue Exposure/Associative Processes, Positive Reinforcement, and Negative Reinforcement).

Mean scores on the WISDM PDM, SDM, and total score for each level of preferred media language is depicted in Figure 2. Scores on the WISDM PDM, SDM, and total score decreased with increasing acculturation. No interaction effect of gender and acculturation indicators predicted WISDM scores.

3.4 Mediation of the acculturation-cessation relationship

Although time to first cigarette and number of cigarettes per day showed significant relationships with indicators of length of residence in the U.S., the relationships were in the direction that excludes these dependence indicators as potential mediators of the relationship between acculturation and cessation (i.e., physical dependence was positively related to acculturation indicators). Additionally, previous research found that these indicators did not predict cessation in this sample (Reitzel et al., 2009). Thus, time to first cigarette and number of cigarettes per day were not examined for mediation effects. However, PDM, SDM and the WISDM total score demonstrated relationships with preferred media language in the direction that would be expected if they serve as mediators of the relation between preference for English language media and smoking cessation (i.e., PDM, SDM and the total score were negatively related to language preference). Thus, mediation analyses examining the potential mediation effects of PDM and SDM on the relationship between preferred media language and abstinence were performed.

Castro et al. previously demonstrated in this sample that greater preference for English language media was related to greater likelihood of smoking abstinence (Castro et al., 2009). Here, the potential mediators, WISDM total score, PDM and SDM were examined for their relationship with abstinence in the current sample, controlling for demographics, gender, and treatment group. These results indicated that only PDM was a significant predictor of abstinence (AOR = .83, 95% CI = .69-.99; $p = .04$). SDM and WISDM total score did not predict abstinence ($p = .31$, and $p = .15$, respectively). Further, PDM remained a significant predictor of abstinence after accounting for SDM (AOR = .72, 95% CI = .52-.99; $p = .04$).

Next, simple and multiple mediation analyses were conducted to examine the potential mediating effects of PDM and SDM. Simple mediation analyses indicated that neither PDM nor SDM were significant mediators alone (PDM indirect effect = .07, 95% CI = -.001; .20; SDM indirect effect = -.04, 95% CI = -.04; .14). Results of the multiple mediation analysis indicated that PDM had a significant unique mediating effect on the relationship between preferred media language and abstinence (indirect effect = .13, 95% CI = .005; .36), but SDM did not (indirect effect = -.07, 95% CI = -.26; .04). Although the current mediation analyses were adjusted for gender, Castro et al. found a significant effect of acculturation on cessation only among men. Therefore, mediational analyses were repeated using only the male sample. This produced identical results.

4.0 Discussion

The relationship of acculturation indicators and tobacco dependence is complex, with the direction of the association being dependent on the type of indicators of both acculturation and dependence. For example, greater acculturation as indicated by length of residence in the U.S. was positively related to unidimensional indicators of physical dependence (i.e., number of cigarettes smoked per day and smoking within five minutes of waking). Conversely, a preference for English language media, was related to lower dependence when using a multidimensional measure of dependence. As detailed below, it may be useful to interpret these contradictory findings within the context of Berry's (2005) model of acculturative stress, by which changes in physical dependence might be seen as behavioral shifts, whereas changes in psychological dependence may be influenced by acculturative stress. Relationships between acculturation indicators and dependence did not differ by gender, and gender had a very minimal influence on dependence indicators (i.e., men and women differed only on two WISDM subscales). A mediational model indicated that WISDM primary dependence was a significant mediator of the relationship between preferred media language and abstinence. That is, a preference for English language media predicted lower dependence that was, in turn, associated with greater success at cessation.

Consistent with previous research (Marín et al., 1989; Palinkas et al., 1993) the current study found that greater duration of exposure to U.S. society and culture (as measured by years spent in the U.S. and proportion of life spent in the U.S.) were significantly associated with increases in cigarettes per day and with increased likelihood of smoking one's first cigarette within five minutes of waking. However, these unidimensional indicators of physical dependence were not predictive of, also consistent with previous research among Latinos (Bock et al., 2005; Perez-Stable et al., 1991; Woodruff et al., 2002). Interpreted within Berry's model of cultural adaptation, increases in cigarette consumption and time to first cigarette may represent an acculturative behavioral shift associated with dominant culture exposure, but not necessarily an increase in tobacco dependence more broadly defined. That being said, an area fruitful area of future research in this area may be in regards to understanding how the characteristics of the acculturating individual's environment (e.g., living in an ethnic enclave, versus not, proportion of Latinos or Spanish-only speakers in one's neighborhood) may interact with time of residency in the U.S., and length of residency in a particular neighborhood, to influence behavioral shifts like smoking behavior.

Additionally, although significant positive relationships were found between indicators of time in the U.S. and physical dependence, it should be noted that even among those individuals with the greatest time in the U.S., the daily smoking rate was about 12 cigarettes, and less than 20% smoked their first cigarette within five minutes of waking. Thus, even the heaviest Latino smokers in this sample were relatively low level smokers. Coupled with previous findings regarding the lack of predictive utility of physical dependence indicators among Latinos with regards to abstinence (Bock et al., 2005; Perez-Stable et al., 1991; Reitzel et al., 2009; Woodruff et al., 2002) these results suggest that indicators of physical dependence alone may not be an appropriate method for inferring tobacco dependence more broadly among Latino smokers.

In contrast, scores on a multidimensional, motives-based measure of dependence generally decreased with increasing preference for English language media. Three of the four scales that comprise PDM (Craving, Automaticity and Loss of Control) and five of the nine scales that comprise SDM (Affiliative Attachment, Behavioral Choice, Cue Exposure, Positive Reinforcement, Negative Reinforcement) were negatively associated with language preference. These findings are consistent with Castro et al.'s (2009) findings that more highly acculturated Latino smokers had higher cessation rates than their lower-accultured counterparts. Interpreted within Berry's (2005) conceptualization of acculturative stress, stressors may decline with higher levels of cultural engagement or identification (as measured by language preference), and that may reduce dependence on tobacco. Consistent with explanation, mediation analysis found that media language preference had an indirect effect on cessation through primary dependence motives.

This is among the first explanatory models of cultural influences on smoking cessation among Latinos. However, it raises additional questions, such as, why Latino smokers with greater preference for English experience less dependence? One possibility is that more acculturated Latinos may have access to more psychological resources (e.g., social support) that help them to manifest less dependence on smoking, and these factors together may contribute to successful cessation. Alternatively, greater acculturation is associated with fewer depressive symptoms (Black et al., 1998; Gallagher-Thompson et al., 1997; Masten et al., 1994; Torres & Rollock, 2007; Zamanian et al., 1992), English-language speaking pressures, and pressure toward acculturation (Schwartz & Zamboanga, 2008). The lessening of these pressures may lead to less dependence on smoking. Although current findings can be interpreted consistent with the acculturative stress model, the current study is limited in that measures of acculturative stress were not available to directly test the acculturative stress model. Thus, future research would benefit from expansion of the mediational model

tested here to include acculturative stress, as well as other social and intrapersonal influences on cessation.

Conclusions regarding the current mediation analyses are tempered by the fact that no acculturation indicator other than media preference was significantly related to the multidimensional measure of tobacco dependence. Thus, this result could be a chance finding. However, given that the direction of the relationship was consistent with predictions, and tobacco dependence was found to be a significant mediator of the relationship between language preference and cessation, this finding merits further study. More generally, the results suggest that a multidimensional, motives-based approach to measuring dependence might better capture dependence among Spanish-speaking smokers compared to unidimensional, physiologically-based measures. Use of a more comprehensive measure of dependence (that considers both physical and non-physical aspects) better predicts cessation among Latinos compared to single item indicators of physical dependence (e.g., cigarettes per day). Use of a multidimensional measure is encouraged in future research.

Gender had a minimal impact on dependence, and no interactions of gender and acculturation indicators predicted dependence. No differences emerged between men and women on indicators of physical dependence. Women scored higher on the WISDM Positive Reinforcement scale, and men scored higher on the WISDM Social/Environmental Goals scale. However, there were no differences between men and women on the two higher order factors of the WISDM or the WISDM total score. This suggests that the current inferences regarding acculturation and dependence apply similarly to men and women. However, given that acculturation affects major smoking outcomes (e.g., prevalence and cessation) differently for Latino men and women, the relevant mechanisms underlying such differential effects remain to be identified. Future research might continue to address this question by examining gender and acculturation as they relate to other mechanisms underlying smoking (e.g., self-efficacy, social support).

The current study has several limitations. The study was the first to examine the association of cultural variables with multiple dimensions of tobacco dependence. As such, there were a number of novel findings that require replication, particularly as no correction for multiple statistical tests was used. This study used demographic indicators of acculturation, rather than a comprehensive acculturation scale, and such proxies may less effectively tap into an individual's level of adoption and internalization of mainstream practices, culture, and values. Just as the current study benefited from a multidimensional measure of dependence, research on acculturation among Latino smokers would benefit from use of a more comprehensive multidimensional measure of acculturation. This study examined self-report of abstinence and lacked biochemical verification. However one meta-analysis found that self-report of abstinence is nevertheless quite reliable, with sensitivity and specificity of 87.5% and 89.2%, respectively (Patrick, Cheadle, Thompson et al., 1994), and another review concluded that analyses of estimated misclassification of smoking status is generally small and rarely changes conclusions (Velicer, Prochaska, Rossi, et al., 1992). The relative homogeneity in acculturation level (low acculturated, Spanish-speaking smokers seeking counseling in Spanish) limits the generalizability of the findings. Similarly, current findings are limited to individuals who were interested in quitting smoking. Last, due to the small sample size of subgroups by country or region of ancestry, analyses examining Latino subgroups could not be done. Given known differences in the smoking prevalence rates of Latino subgroups, future research examining determinants of smoking should be particularly sensitive to the issue of generalizability across Latino subgroups.

5.0 Conclusions

In sum, the current study found that indicators of time in the U.S. were related to indicators of physical dependence, while an indicator of language preference was related to a multidimensional measure of dependence motives. The direction of these effects were different, with greater time in the U.S. associated with smoking more cigarettes per day and less time to the first cigarette of the day, and greater preference for English language media associated with less dependence on a multidimensional measure. Mediation analyses suggest dependence may be an important mechanism underlying the relationship between preferred media language and cessation. Future research is needed to replicate and further explicate these relationships.

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Highlights

- Physiological dependence relates to time spent in the United States.
- Psychological dependence relates to preference for English language media.
- Acculturation may affect smoking cessation indirectly by affecting nicotine dependence.
- Indicators of physical and non-physical dependence are differentially related to various facets of acculturation.
- Multidimensional approaches to the measurement of both nicotine dependence and acculturation are necessary to understand what appears to be a complex relationship between these variables.

Figure 1.
(A, B, and C) Relationships between indicators of physical dependence and indicators of time spent in the U.S.

Figure 2.
(A and B) Relationships between WISDM scores and media language preference.

Table 1
Participant Characteristics by Gender

	Women N=133	Men N=164
	Mean (SD)	Mean (SD)
Age	42.11 (10.9)	40.37 (11.77)
Years of education	10.8 (4.06)	10.91 (3.98)
Number of cigarettes per day	10.31 (8.63)	10.36 (8.18)
Years in U.S.	16.07 (12.21)	15.36 (13.51)
Proportion of life in U.S.	36.78 (24.2)	35.78 (25.85)
	N (%)	N (%)
Yearly household income		
Less than \$20,000	82 (63.6)	79 (49.1)
\$20,000 or more	47 (36.4)	82 (50.9)
Partner status		
Have partner	41 (31.1)	55 (33.5)
No partner	91 (68.9)	109 (66.5)
Time to first cigarette		
5 minutes or less	24 (18.3)	21 (13.4)
6 minutes or more	107 (81.7)	136 (86.6)
Immigrant status		
Immigrant	126 (94.7)	151 (93.2)
Non-immigrant	7 (5.3)	11 (6.8)
Language used at home		
Only/mostly Spanish	117 (88.0)	151 (92.1)
Both equally	8 (6.0)	10 (6.1)
Only/mostly English	8 (6.0)	3 (1.8)
Language used at work		
Only/mostly Spanish	49 (65.3)	94 (64.4)
Both equally	10 (13.3)	22 (15.1)
Only/mostly English	16 (21.3)	30 (20.5)
Preferred media language		
Only/mostly Spanish	96 (72.7)	103 (63.2)
Both equally	27 (20.5)	38 (23.3)
Only/mostly English	9 (6.8)	22 (13.5)

Note. Bold indicates significant difference, $p < .05$. One participant did not report age. Number of years in the U.S. and proportion of life in the U.S. could not be computed for 10 participants. Seven participants did not report income, one did not report marital status, nine did not report time to first cigarette, two did not report immigrant status, 76 did not report language spoken at work or this item was not applicable, and two did not report preferred media language.

Table 2
Main Effects of Preferred Media Language and Gender on WISDM Scales

WISDM Scale used as dependent variable	Main effect of preferred media language		Main effect of gender	
	p-value	β	p-value	β
WISDM Primary Dependence	.002	-.184	.46	-.044
WISDM Secondary aDependence	.005	-.170	.36	-.054
WISDM total	.002	-.183	.37	-.053
WISDM Automaticity	.008	-.162	.48	-.042
WISDM Craving	.001	-.20	.99	.001
WISDM Loss of Control	.004	-.175	.16	-.084
WISDM Tolerance	.07	-.11	.66	-.026
WISDM Affiliative Attachment	.004	-.172	.09	-.101
WISDM Behavioral Choice/Melioration	<.001	-.232	.10	-.097
WISDM Cognitive Enhancement	.07	-.111	.99	.000
WISDM Cue Exposure/Associative Processes	.03	-.13	.44	-.046
WISDM Negative Reinforcement	.02	-.146	.18	-.080
WISDM Positive Reinforcement	.02	-.143	.048	-.118
WISDM Social-environmental Goads	.53	-.037	.003	.178
WISDM Taste/Sensory Processes	.14	-.090	.19	-.078
WISDM Weight Control	.09	-.104	.38	-.053

Note: WISDM= Wisconsin Inventory of Smoking Dependence Motives. Analyses are controlled for age, income, education, and partner status. Analyses of the main effect of preferred media also control for gender, and analyses of the main effect of gender also control for preferred media language.