BRIEF REPORT

Failure to Replicate the Structure of a Spanish-Language Brief Wisconsin Inventory of Smoking Dependence Motives Across Three Samples of Latino Smokers

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ABSTRACT

Background: Research in smoking is hindered by a lack of validated measures available in languages other than English. Availability of measures in languages other than English is vital to the inclusion of diverse groups in smoking research. To help address this gap, this study attempted to validate a Spanish-language version of the brief Wisconsin Inventory of Smoking Dependence Motives (Brief WISDM).

Methods: Data from 3 independent, diverse samples of Spanish-speaking Latino smokers seeking cessation counseling were utilized. Confirmatory factor analyses of 3 known structures of the Brief WISDM were examined for fit within each sample. A separate analysis was also conducted with the 3 samples combined. A post-hoc exploratory factor analyses with the combined sample was also conducted.

Results: Across 12 confirmatory factor analyses, none of the 3 structures demonstrated good fit in any of the samples independently or in the combined sample. Across the 3 samples, high intercorrelations (>.90) were found among the Loss of Control, Craving, Tolerance, and Cue Exposure scales, suggesting great redundancy among these scales. An exploratory factor analyses (EFAs) further supported these high intercorrelations. Some subscales remained intact in the EFA but accounted for little variance.

Conclusions: Overall, this study was unable to replicate the structure of a Spanish-language Brief WISDM in 3 independent samples of smokers. Possible explanations include inadequate translation of the measure and/or true and meaningful differences in the construct of dependence among Spanish-speaking Latino smokers. Both possibilities merit further research.

INTRODUCTION

Latinos differ from the general population in smoking prevalence and patterns. The smoking prevalence is lower among Latinos versus the general U.S. population (12.5% vs. 19 %; Centers for Disease Control and Prevention, 2012). They are more likely to smoke fewer than 10 cigarettes per day (Lawrence, Fagan, Backinger, Gibson, & Hartman, 2007), more likely to smoke on a nondaily basis (Pérez-Stable et al., 2001; Trinidad et al., 2009; Zhu, Pulvers, Zhuang, & Báezconde-Garbanati, 2007), and wait longer to smoke after waking (Benowitz et al., 2009; Caraballo et al., 1998). Importantly, traditional measures of smoking patterns and dependence such as number of cigarettes smoked per day, heaviness of smoking, and time to one's first cigarette of the day are poor predictors of smoking outcomes among Latino smokers (Reitzel et al., 2009; Rodríguez-Esquivel, Cooper, Blow, & Resor, 2009; Woodruff, Talavera, & Elder, 2002).

As such, theory-based, multidimensional measures of tobacco dependence (e.g., Etter, Le Houezec, & Perneger, 2003; Piper et al., 2004; Shiffman, Waters, & Hickcox, 2004) may prove vital to understanding dependence and its influence on cessation among Latino smokers. For smokers who speak only or prefer to speak Spanish, researchers should first ensure the appropriateness of scale translations. Assuming linguistic equivalence, use of such measures may allow for a better understanding of the dependence construct among diverse populations.

This study attempts to replicate the psychometric structure of a Spanish translation of the widely used, well-validated Brief Wisconsin Inventory of Smoking Dependence Motives (Brief WISDM; Smith et al., 2010). To the best of our knowledge, this is the first study to evaluate a Spanish translation of the Brief WISDM. It was predicted that its 11-factor would be replicated in three independent, diverse samples of Spanish-speaking Latino smokers.

METHODS

Participants and Procedures

This study utilized data from three samples of Spanish-speaking Latino smokers seeking cessation counseling. Each study protocol was approved by the Institutional Review Board of The University of Texas MD Anderson Cancer Center. Each study's procedures were conducted in Spanish, and data from the baseline (prequit) assessments of the Brief WISDM were utilized.

Sample 1

¡Adiós al Fumar! (*Adiós*) was a randomized clinical trial evaluating the efficacy of a telephone cessation intervention among 297 Spanish-speaking Latino smokers across Texas. The WISDM was administered prior to randomization. Full details regarding the study procedures are in Wetter et al. (2007).

Sample 2

Por Nuestra Salud (*PNS*) was a longitudinal cohort study examining social determinants of cessation 199 Spanish-speaking smokers of Mexican descent in Houston, Texas. Full details regarding the study procedures are in Kendzor et al. (2014).

Sample 3

Cuídate was a randomized clinical trial evaluating the efficacy of motivation and problem-solving (Vidrine et al., 2013) for treating tobacco and at-risk alcohol use among 202 Puerto Rican smokers. Participants were randomly assigned to treatment with either an exclusive focus on smoking cessation or a focus on smoking cessation and reduction of at-risk drinking. Participants received self-help materials and seven telephone counseling sessions and were followed up to 52 weeks postquit. All participants were residing in Puerto Rico at the time of the study. The WISDM was administered prior to randomization.

Spanish Translation

The Brief WISDM was translated following standard back-translation procedures (Brislin, 1986). The English version was translated into Spanish by six bilingual members of the research team who identified Spanish as their native language. Five different bilingual research team members translated the items back into English. At each iteration, the translators worked together and any discrepancies were discussed and resolved through consensus. The final translated version was evaluated by the study site's Medical Translation Services office. Finally, the translated version was pretested with 20 monolingual Spanish-speaking smokers and revised based on their feedback.

Measures

Participant Characteristics

Demographic variables examined include age, gender, education, partner status, household income, employment status, language spoken at home, nativity, and ethnicity. Tobacco-related variables included number of cigarettes smoked per day and time to the first cigarette after waking. Participant characteristics are presented in Table 1.

Brief WISDM

The Brief WISDM assesses the motivational domains that underlie tobacco dependence (Smith et al., 2010). It includes 37 items that comprise 11 subscales. Participants rate each item on a scale of 1 (*not at all true of me*) to 7 (*extremely true of me*). The 11 subscales are grouped in two higher order factors: Primary Dependence Motives (PDM) and Secondary Dependence Motives (SDM). The PDM scale comprises the average of four subscale scores: Automaticity, Loss of Control, Craving, and Tolerance. The SDM scale comprises the average scores of the remaining scales: Affiliative Attachment, Cognitive Enhancement, Cue Exposure/Associative Processes, Social/Environmental Goads, Taste, Weight Control, and Affective Enhancement. The Brief WISDM has demonstrated good (Smith et al., 2010) to adequate (Ma, Li, & Payne, 2012) measurement structure. A Hungarian translation of the Brief WISDM has also demonstrated good measurement structure (Vajer, Urbán, Tombor, Stauder, & Kalabay, 2011).

Data Analysis

Items were examined for significant nonnormality via skewness and kurtosis statistics <2.0 and <4.0, respectively (Kim, 2012). Similar to previous studies (Ma et al., 2012; Smith et al., 2010; Vajer et al., 2011), confirmatory factor analysis (CFA) was utilized to examine the appropriateness of three models: (a) an 11-factor model, (b) an 11-factor model with four estimated error covariances (between items 3 and 31, 2 and 16, 35 and 36, and 28 and 36), and (c) an 11-factor model with two higher order factors (representing PDM and SDM). In addition to the model chi-square, the following indices were used to assess model fit, consistent with Hooper, Coughlan, and Mullen (2008): comparative fit index (CFI) and Tucker–Lewis Index (TLI) ≥ 0.95, root mean-squared error of approximation (RMSEA) < 0.06., and standardized root mean square residual (SRMR) < 0.05. Model modifications were not considered given the primary goal of replicating previously established structures. Analyses were conducted separately for each sample and with the samples combined. Analyses were performed with the Mplus software package (Muthen & Muthen, 1998–2012).

RESULTS

Preliminary Analyses

All skewness and kurtosis statistics were in the acceptable range. For models 1 and 2, all CFA analyses were rendered invalid a due to a nonpositive definite matrix in each analysis. This may have been due to high correlations (>.90) among the factors Loss of Control, Cue Exposure, Craving, and Tolerance across all samples. Regarding model 3, fit indices did not indicate a clearly acceptable model in two of the samples and the combined sample: *Adiós*, χ^2 (613) = 1127.75, $p <$ .0001, RMSEA = 0.05, CFI = 0.91, TLI = 0.91, SRMR = 0.05; *Cuídate*, χ^2 (613) = 1199.52, $p <$ .0001, RMSEA = 0.069, CFI = 0.89, TLI = 0.89, SRMR = 0.06; combined sample, χ^2 (613) = 1747.0, $p <$ .0001, RMSEA = 0.051, CFI = 0.92, TLI = 0.92, SRMR = 0.08. Model 3 in *PNS* failed to converge. Suggested strategies to produce model convergence (i.e., increasing the number of iterations, changing model start values) were unsuccessful, suggesting the model is not appropriate for the data (Muthen & Muthen, 1998–2012).

Table 1. Participant Characteristics

	Adiós al Fumar	Por Nuestra Salud	Cuídate
		M (SD)	
Age (years)	41.15 (11.40)	38.73 (10.14)[a]	43.59 (11.78)[a,b]
Cigarettes/day	10.34 (8.37)	15.77 (9.57)[a]	16.82 (8.60)[a]
Years smoked	21.72 (10.49)	20.47 (9.96)	25.25 (11.89)[a,b]
		N (%)	
Education			
12 years or more	148 (49.8)	44 (22.1)[a]	138 (68.3)[a,b]
Employed	209 (70.4)	135 (68.2)	115 (56.9)[a,b]
Familial country/region of origin			
Central America	47 (15.8)	–	–
Cuba	10 (3.4)	–	–
Mexico	198 (66.7)	199 (100)	–
Puerto Rico	1 (.3)	–	194 (96.0)
South America	36 (12.1)	–	2 (1.0)
Other	5 (1.7)	–	6 (3.0)
Gender			
Male	164 (55.2)	126 (63.3)	109 (54.0)
Language spoken at home			
Spanish only	183 (61.6)	86 (43.2)[a]	118 (58.4)[b]
Nativity			
Born outside U.S. mainland	277 (93.3)	163 (90.6)	182 (90.1)
Partner status			
Married/living with partner	200 (67.3)	138 (69.4)	81 (40.1)[a, b]
Time to first cigarette			
Less than 5 min after waking	45 (15.6)	64 (32.2)[a]	72 (35.6)[a]

Note. The groups could not be compared on familial country/region of origin due to numerous cells with a zero value.
[a]Significantly different from *Adios al Fumar.*
[b]Significantly different from *Por Nuestra Salud.*

Post-Hoc Exploratory Factor Analysis

An exploratory factor analysis (EFA) of the Brief WISDM with the combined sample indicated that a seven-factor structure was the best fit for the data. This model accounted for 63.4% of variance in the data (cf., a recommended minimum of 70%; Stevens, 2002) and produced adequate RMSEA and SRMR statistics, but slightly less than ideal TLI and CFI: χ^2 (428) = 1259, $p <$ .0001; RMSEA = 0.05, CFI = 0.94, TLI = 0.91, SRMR = 0.03). Factor 1 alone accounted for 38.5% of variance. When considering a minimum factor loading of 0.40 (Stevens, 2002), eight of the 37 items did not load on any factor. A summary of this analysis is presented in Supplementary Table 1.

DISCUSSION

This study was unable to replicate the factor structure of a Spanish translation of the Brief WISDM across three independent samples of Spanish-speaking Latino smokers. Models 1 and 2 demonstrated poor fit across all samples. Model 3 "approached" acceptable fit in the *Adiós* sample but did not demonstrate good fit in the remaining two samples or the combined sample. Findings suggest that the current translation of the Brief WISDM may not adequately capture tobacco dependence among the target population. It should be emphasized that this study speaks to the adequacy of a Spanish translation of

the Brief WISDM and not the utility of the original English-language Brief WISDM. Previous research supports its utility in English-speaking samples (Ma et al., 2012; Smith et al., 2010).

There are at least two possible sources of this lack of fit. First, although the Brief WISDM underwent a thorough translation process, it is possible that linguistic equivalence was not achieved, and the Spanish version did not capture tobacco dependence as intended. Second, assuming linguistic equivalence, the construct of tobacco dependence as assessed by the Brief WISDM may not be appropriate for Spanish-speaking Latino smokers. Participants appear to see no distinction among the concepts of Loss of Control, Cue Exposure, Craving, and Tolerance. On the one hand, translators may not have used adequately distinct terminology in the items that make up these subscales. On the other hand, Spanish-speaking Latino smokers may endorse a general loss of autonomy over cigarettes rather than make the distinctions implied by these subscales.

In an EFA of the Brief WISDM, the scales Automaticity, Social/Environmental Goads, and Weight Control remained intact (factors 2, 5, and 7). Affiliative Attachment items also loaded together (factor 3; along with two items from Loss of Control). Thus, researchers who are interested in these constructs may still find translations of these subscales useful. Factor 1 included all items from the Affective Enhancement and Cognitive Enhancement subscales and two items from the Taste subscale. One could interpret this factor as a broad

"positive reinforcement" factor. That this factor accounted for 38.5% of the variance may indicate the relative importance of positive reinforcement Spanish-speaking Latinos. Consistent with a broad "loss-of-autonomy" perspective, factor 6 was comprised of one item from Loss of Control, one from Craving, and two from Tolerance. Two items from Tolerance comprised their own factor (factor 4) although this may reflect item redundancy ("I usually want to smoke right after I wake up" and "I smoke within the first 30 minutes of waking in the morning"). The remaining items did not load onto any factor.

Future research with independent Spanish translations may rule out problems with the Brief WISDM structure. If independent translations of the measure can successfully replicate the Brief WISDM structure, then current translation may have simply failed to achieve linguistic equivalence. To identify potential problems with the measurement structure, formative research that engages the target population may ensure the applicability and utility of the dependence construct itself (Hunt & Bhopal, 2004). This approach may shed light on aspects of dependence not currently captured here and can assist in identifying appropriate terminology for describing aspects of dependence. Such research could come in the form of in-depth interviews or focus groups with Spanish-speaking smokers and cognitive testing of Spanish-language measures (Hunt & Bhopal, 2004).

This study does not report other psychometric properties (e.g., reliability and other validity examinations). These are important psychometric tests; however, a prerequisite for their use is evidence of a latent variable common to the scale items (Raykov, 2011; Raykov & Shrout, 2002; Zinbarg, Yovel, Revelle, & McDonald, 2006). As findings indicate that this assumption does not hold, it was inappropriate to report these tests. Similarly, scale descriptives are not reported as interpretation of observed scores is not appropriate in the absence of evidence of validity (American Educational Research Association, 1999).

In summary, this Spanish translation of the Brief WISDM may not be appropriate for Spanish-speaking Latino smokers. Future research should clarify whether current findings are due to failure to not achieve linguistic equivalence or to true differences in the construct of dependence among this population of smokers. Results of a post-hoc EFA provide hypotheses of how motives for smoking might be different for Spanish-speaking Latinos but should not be considered an alternative structure.

SUPPLEMENTARY MATERIAL

Supplementary Table 1 can be found online at http://www.ntr.oxfordjournals.org

FUNDING

DECLARATION OF INTERESTS

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