



Does warning language impact perceptions? Results from an exploratory experiment comparing English, Spanish, and Dual language E-Cigarette warnings among Spanish speakers in the US

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ABSTRACT

Tobacco warnings written in English may not be as effective among Spanish speakers. We explored whether warning perceptions differ based on exposure to English, Spanish, or dual language warnings. From November 2, 2020 – December 29, 2020, we conducted an online experiment with a convenience sample of 776 Spanish-speaking adults in the US, randomizing each to one of three warning conditions: English only, Spanish only, or dual (both English and Spanish). Multivariable linear and logistic regressions examined associations between warning exposure and perceptions. Of 776 participants, 291 preferred to read in Spanish, 55.5% were male, 62.5% were Hispanic, and 48.1% reported past 30-day e-cigarette use. Negative affect ($\beta = 1.79$, $p = 0.007$), perceived message effectiveness ($\beta = 0.84$, $p = 0.007$), and psychological reactance ($\beta = 1.55$, $p < 0.001$) were greater among participants exposed to the dual language warnings compared to those exposed to the English warnings. Results of this exploratory study suggest that e-cigarette warning statements presented in both English and Spanish may result in stronger reactions among Spanish speakers. With increasing prevalence of Spanish speakers in the US, future work should continue to examine this topic.

1. Introduction

Warning statements are required on tobacco advertisements in the United States (US) to inform consumers about product risks (HHS F & DA, 2021; Food and Drug Administration, 2016). The US Food and Drug Administration (FDA) requires warning statements on advertisements for covered tobacco products, including e-cigarettes, to be printed in the language of the publication medium (HHS F & DA, 2021; Food and Drug Administration, 2016). The text in each warning statement must be in the English language except when the advertisement appears in a non-English medium, in which case the warning text must appear in the medium's predominant language (Food and Drug Administration, 2021). Previous tobacco warning statements have been published in Spanish (Rutgers School of Public Health, 2021), but we are not aware of any research assessing their effectiveness among a Spanish-speaking

population.

The US Census Bureau reported 41.8 million people (13.5%) in the US spoke Spanish in 2019, 16.1 million of whom spoke English “less than very well” (US Census Bureau, 2019). This is an increase from 36 million, or 12.8% of the population, in 2010 (US Census Bureau, 2010). Despite this increase, research on the effectiveness of English and Spanish warnings among Spanish-speaking populations is limited. English warnings and labels are often misunderstood or ignored (Mohan et al., 2013; Marín and Gamba, 1997; Morris et al., 2011), but it is unclear whether Spanish or dual language warnings would be more effective in capturing viewers' attention and influencing perceptions. Though not focused specifically on warning statements, a recent study examining the reach of a different type of tobacco control communication intervention, the FDA's The Real Cost health education campaign, noted bilingual youth in the US were less likely to report exposure to the

Abbreviations: US, United States; FDA, Food and Drug Administration; MTurk, Amazon Mechanical Turk.

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campaign, suggesting potential concerns about cultural reach and relevance (Mantey et al., 2021). Similar concerns may extend to tobacco warnings.

The mechanisms through which tobacco warnings are effective have been extensively documented, particularly for cigarette warnings. Tobacco warnings are effective at reducing cigarette smoking by reducing appeal, encouraging cessation, and preventing initiation because they evoke emotion and stimulate cognitions that increase harm perceptions and ultimately influence use (Hammond, 2011; Noar et al., 2017; Noar et al., 2016). However, for warnings to be effective, they must be read and understood. Materials delivered in Spanish rather than English may be more appealing among Spanish speakers, translating to greater recall and effectiveness (Stonbraker et al., 2015; Davis et al., 2011). For example, one study found that dual language prescription drug labels increased understanding compared to those written only in English (Mohan et al., 2013). Other studies found that clarity increased when Spanish speakers were presented with Spanish material compared to English material (Mohan et al., 2013; Warnecke et al., 1997; Ramírez et al., 2017). These findings highlight the potential to increase the effectiveness of warnings among those who speak Spanish through the use of warnings in Spanish or in both English and Spanish. This has important implications as the Hispanic community has been a historical target of tobacco industry advertising (Villarroel et al., 2020; Iglesias-Rios and Parascandola, 2013; Acevedo-Garcia et al., 2004) and has notable rates of tobacco and nicotine product use, including for e-cigarettes, a relatively newer tobacco/nicotine product. Indeed, Hispanic adults are the largest racial/ethnic group behind non-Hispanic White adults currently consuming e-cigarettes, with 11.4% reporting use (Villarroel et al., 2020; Wang et al., 2018).

This exploratory study aimed to assess the impact of English-only, Spanish-only, or dual English and Spanish versions of the FDA e-cigarette warning statement among Spanish speakers. We used e-cigarette advertisements because e-cigarette use is common among Hispanic adults (Villarroel et al., 2020), and the FDA has required a single, standard warning statement on all e-cigarette products and advertisements since 2016 (Food and Drug Administration, 2016). The FDA-required warning statement occupies the upper 20% of all e-cigarette advertisements stating: “WARNING: This product contains nicotine. Nicotine is an addictive chemical” (Food and Drug Administration, 2016).

2. Materials and methods

2.1. Sample and procedure

We recruited Spanish-speaking participants from two crowdsourcing platforms widely used in social science and tobacco control research—Prolific and Amazon’s Mechanical Turk (MTurk) (Kraemer et al., 2017; Palan and Schitter, 2018). Participants were recruited from Prolific between November 2nd and December 7th of 2020, and from MTurk December 11th through December 29th. We posted descriptions written in Spanish on Prolific and MTurk to target Spanish speaking and reading participants. Eligible participants completed the survey through Qualtrics. The survey took approximately five minutes to complete and was written entirely in Spanish. Participants were paid \$1.20 through Prolific/MTurk for completing the survey. Several procedures were followed to increase data quality: (1) participants on both platforms were required to possess a 90% or greater platform approval rating with at least 50 previous submissions, and (2) participants unable to correctly pass an attention check item were removed from analyses. When transitioning to the MTurk platform, interested participants were asked to select all from a list of crowdsourcing platforms which they were a member of. Those who selected Prolific were not eligible due to the possibility of having previously completed the survey. Eligible participants were US residents, able to speak Spanish, and at least 18 years of age. Of 3,314 participants screened across Prolific and MTurk, 776

(23.4%) were eligible, passed attention checks, completed study materials, and included for analysis. Additional details on screening and eligibility are in the Supplemental File. This study was approved by the University of Utah Institutional Review Board (IRB_00126237).

We randomized participants to view two e-cigarette advertisements containing the FDA-mandated warning statement in one of three conditions: English-only, Spanish-only, or both (dual) English and Spanish (Fig. 1). Advertisement order was randomized and counterbalanced across participants. Randomization to the warning conditions was also stratified based on language preference (Bilingual but prefer English, Bilingual but prefer Spanish, Only Spanish) to help ensure consistency across language preference.

Stimuli advertisements were obtained from Trinkets and Trash, a tobacco advertising surveillance archive (www.trinketsandtrash.org) (Rutgers School of Public Health, 2021). We selected two advertisements from the same brand which featured minimal text other than the warning statement, and included female models in one advertisement and a male model in the other. The warning statement was featured at the top of the advertisement, per FDA requirements. After viewing the advertisement for at least 10 seconds, participants responded to three items about the advertisement (advertisement appeal, product appeal, likelihood of purchasing) (Stark et al., 2008). After viewing both advertisements, participants responded to items about the warning and about e-cigarette beliefs about addiction or harm and use intentions (Sontag et al., 2019; Mays et al., 2016). Items about the warning included attention (King et al., 2020), recall (King et al., 2020; Strasser et al., 2012), clarity, cognition (how much the warning made participants think about the health risks of vaping) (Hammond et al., 2007), perceived knowledge gained (Magnan and Cameron, 2015), perceived message effectiveness (extent to which participants perceived the message made e-cigarettes seem unpleasant, discouraged their interest in e-cigarettes, and made them more concerned about health effects) (Noar et al., 2016), likelihood to share with friends (Morgan et al., 2018), psychological reactance (extent to which the warning was perceived as being overblown, manipulative, and annoying) (Hall et al., 2018), and negative affect (extent to which the warning evoked emotional reactions including feeling scared, regretful, on edge, disgusted, sad) (Hall et al., 2018). At the end of the survey, participants responded to items on demographics and past 30-day tobacco use (Population Assessment of Tobacco and Health, 2017). The Supplemental File contains additional details on the measures used.

2.2. Language categorization

Participants were characterized by their Spanish language proficiency based on their answer to the question, “Which of the following options best describes your proficiency in Spanish?” (a) Only English, b) Bilingual but prefer English, c) Bilingual but prefer Spanish, or d) Only Spanish). Those who selected “Only English” were not eligible. Participants were also asked whether they preferred English or Spanish when speaking, writing, or reading. Those who indicated one language proficiency but stated they prefer to read, speak, and write in the other language were removed from the sample due to data inconsistency. Given the mixed nature of participants’ Spanish/English proficiency and preferences, as well as the relevance of reading for comprehending textual warning statements, we created a “Spanish-dominant” group for subgroup analysis, operationalized as: those who selected “Only Spanish” or “prefer Spanish” for the proficiency measure and indicated that they preferred to read in Spanish.

2.3. Data analysis

We examined associations between warning condition and outcomes of interest using chi-square tests (for items analyzed as categorical variables, e.g., recall items) and analysis of variance tests (used for all other outcomes, which had 5-point scales and were treated as



Fig. 1. Advertisement warning conditions (in color).

continuous variables). We further conducted multivariable logistic and linear regression models as appropriate for variables in bivariate analyses where $p < 0.05$ (advertisement appeal, likelihood of purchase, negative affect, psychological reactance, clarity, attention, cognition, perceived knowledge gained, and intentions to use). Multivariable regression results controlled for language proficiency and preferences, sex, race and ethnicity, education, income, sexual orientation, days used e-cigarettes, and data source (Prolific or MTurk). Additional analyses were conducted among “Spanish-dominant” participants ($n = 291$). Due to the exploratory nature of this study, to minimize the likelihood of Type 1 error from multiple testing, we used a more conservative level of significance for all analyses, $p < 0.01$.

3. Results

Of 776 participants, 55.5% were male, 62.5% were Hispanic, and 65.6% had a bachelor’s degree or higher. Almost half (48.1%) reported e-cigarette use within the past 30 days, and 54.4% reported past 30-day cigarette use. Due to a programming error, age was only obtained from participants recruited through Prolific ($n = 407$; $\bar{x} = 28.13$, $SD = 9.32$), though all participants were 18 or older (Table 1).

The results from multivariable regression analyses for the full sample are presented in Table 2. We found that negative affect ($\beta = 1.79$, $p = 0.007$), perceived message effectiveness ($\beta = 0.84$, $p = 0.007$), and psychological reactance ($\beta = 1.55$, $p < 0.001$) were greater among participants exposed to the dual language warnings compared to those exposed to the English warnings. There were no significant differences identified for clarity, advertisement appeal, product appeal, likelihood of purchase, attention, cognition, likelihood of sharing with friends,

perceived knowledge gained, or intentions to use.

The results from multivariable regressions among the subgroup of “Spanish-dominant” participants (those who selected ‘only Spanish’ or ‘prefer Spanish’ in language proficiency and stated they prefer to read in Spanish) are presented in Table 3. Psychological reactance was greater among those exposed to the dual language warnings compared to those exposed to the English warnings ($\beta = 2.17$, $p < 0.001$). Additionally, advertisement appeal ($\beta = 1.03$, $p = 0.005$), was greater among those exposed to the Spanish warnings relative to the English warnings. We did not identify differences across warning conditions for warning recall, negative affect, likelihood of purchase, perceived message effectiveness, clarity, attention, perceived knowledge gained, likelihood of sharing with friends, or intentions to use e-cigarettes.

4. Discussion

We explored the impact of English, Spanish, or dual language versions of the FDA’s nicotine addiction warning statement as presented on e-cigarette advertisements among a sample of adult Spanish speakers in the US. Although we found few differences between the Spanish and English versions on a range of warning-related outcomes, we observed some differences between dual-language versus English warnings.

Specifically, perceived message effectiveness and negative affect were greater among those exposed to the dual language warnings versus the English warnings. However, it is not known if these differences can be attributed to having the message in both languages, which may have aided in some comprehension/relevance of the warning, or if it is a consequence of essentially receiving two “doses” of the message, albeit in different languages. We also found that warning reactance was higher

