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The Influence of Linguistic Acculturation and Gender on the Initiation of Substance Use Among Mexican Heritage Preadolescents in the Borderlands

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Abstract

This article examined the impact of linguistic acculturation and gender on the substance use initiation of a sample of 1,473 Mexican heritage preadolescents attending 30 public schools in Phoenix, Arizona. It was hypothesized that linguistic acculturation operates differently as a risk or protective factor for young children than for older youth. The study used discrete-time event history methods to model the rate at which nonusing children initiate substance use. Alcohol, cigarettes, marijuana, and inhalants were studied separately while inhalant use was examined more closely. Results suggested that while linguistic acculturation is a risk factor for Mexican heritage preadolescents, this association depended on gender, the linguistic acculturation context (family, friends, or media), and the type of substance. For inhalants, higher linguistic acculturation with friends was inversely associated with drug initiation both for boys and girls. Implications for preventive science and future intervention research are discussed.

Keywords

acculturation; bilingual/bicultural; Hispanic/Latino/Latina; substance use/alcohol and drug use

Much of the existing knowledge regarding risk and protective factors for substance abuse derives from studies of adolescents and adults (Merline, Jager, & Schulenberg, 2008). Few substance use studies have included pre-adolescents and younger children while even fewer consider the impact of linguistic acculturation (Donovan, 2007). Studying the initiation of alcohol and drug use in middle childhood is significant because it can help identify key factors in the onset of substance use that may help prevent the development of substance abuse problems in adolescence and adulthood (Anthony & Petronis, 1995). Middle childhood is typically defined as the stage of child development between the ages of 7 and 11 (Eccles, 1999). This is an age where differentiation from family is not yet achieved but there is an exploration of social environments outside the home, which can put children at risk. In addition, ethnic minority children at this developmental stage face growing pressures

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to reconcile cultural differences in norms and behaviors (including substance use) between home and the larger environment (Donovan, 2007).

The estimated 45.5 million Latinos in the United States are the nation's largest ethnic minority group, and almost two thirds (64%) of them are of Mexican heritage (U.S. Census Bureau, 2008). More than 35 million U.S. residents 5 years old or older speak Spanish at home, including 22% to 30% of the residents of Texas, New Mexico, California, and Arizona, again mostly of Mexican heritage (U.S. Census Bureau, 2006). Latino adolescents report high current use rates (last 30 days) of alcohol and other drugs, 25.3% for alcohol, 8.2% for cigarette smoking, and 9% for illicit drug use (Substance Abuse and Mental Health Services Administration, 2007) and report the highest usage rates for most types of drugs compared to Anglo and African American students of the same age (Johnston, O'Malley, Bachman, & Schulenberg, 2005). At the same time, there has been a dramatic increase in the drug use rates of girls, with gender differences narrowing on both sides of the U.S.-Mexico border (Benjet et al., 2007).

Purpose

The purpose of this study was to advance knowledge about the risk and protective factors and social contexts that influence the initiation of drug use among Mexican heritage preadolescents. Young children live within narrower social contexts than their older counterparts, and their behaviors are likely to be more influenced by the family. This constricted social context may protect children in immigrant families from acculturative stress and unsupervised acculturation-related expansion of their social networks that can put them at risk for drug use and other disorders (Comway, Swendsen, Dierker, Canino, & Merikangas, 2007).

One key difference between preadolescents and older youth is that higher levels of parental monitoring and control may protect younger children from exposure to prodrug attitudes and to environments where drugs are used (Miller, McKay, & Baptiste, 2005). While their children go through middle childhood, parents may not necessarily be aware of the possibility of their younger children's experimentation with drugs. Parents tend to be less aware of their children's substance use in the 12 to 14 than the 15 to 17 age groups (Substance Abuse and Mental Health Services Administration, 2008). The lack of parental awareness about drug use experimentation among younger children can be accentuated by environmental stressors such as the acculturation process, the focus of this study.

Linguistic Acculturation

Acculturation has been typically defined as the process of acquisition of cultural aspects of a dominant culture by members of nondominant cultures; however, acculturation is not a linear process but instead has been increasingly defined as a multidirectional cultural change process (Berry, 2003). Acculturation is triggered by intercultural contact, which produces changes in attitudes, norms, behaviors, knowledge, and identity (Berry, 2007). Just as interactions among cultures may lead ethnic minority individuals to adopt cultural majority norms and values, members of majority cultures may also acculturate into minority cultures, and individuals may acculturate from one minority culture into another minority culture (Berry, 2003).

Linguistic acculturation is a key dimension of acculturation and it is commonly used as a marker for the larger process of acculturation. In the case of non-English speaking immigrant communities, English acquisition goes hand in hand with the process of incorporating the norms and values of the majority culture; English acquisition makes acculturation possible (Pérez, Foruna, & Algeria, 2008). Language use is a common proxy

for measuring acculturation among different immigrant groups, especially in substance use research (An, Cochran, Mays, & McCarthy, 2008; Schwartz, Montgomery, & Brione, 2006; Valencia & Johnson, 2008).

The drug abuse literature has established a positive association between linguistic acculturation and higher levels of substance use (Saint-Jean, Martinez, & Crandall, 2008; Szapocznik & Kurtines, 1980, Vega & Gil, 1998). One explanation for this association is that some individuals may experience stress when acquiring a new language and adapting to a new culture; acculturative stress in turn may lead to drug use and other health problems (Breslau et al., 2007; Finch, Frank, & Vega, 2004; Turner, Lloyd, & Taylor, 2006). Linguistic acculturation has been also described as an indicator of cultural integration and in turn cultural integration may be more directly connected to certain risk or protective behaviors than linguistic acculturation (Kuran & Sandholm, 2008).

Some studies have found a specific link between acculturative stress and substance use in Latino populations (Barnes, 1979; Barrett, Joe, & Simpson, 1991; Bonnheim & Korman, 1985, Conway et al., 2007). On the other hand, language isolation has been identified as a possible protective factor against risk and English acquisition has been identified as possible risk factor making the acculturating individuals more vulnerable to the host culture's prodrug use norms, attitudes, and models of behavior (Gilbert & Cervantes, 1986). In general, attitudes toward substance use are more liberal in the United States than in Latin-American-heritage communities (Escobar, 1998).

Immigrant children and adolescents become exposed to mainstream language, norms, and values through different pathways or contexts. Furthermore, these contexts vary in the extent to which the use of mainstream language may be useful or beneficial (Birman, 1998; Sasao & Sue, 1993). The three most common contexts where linguistic acculturation is measured are language use with family, friends, and media (Marin & Gamba, 1996; Marin, Sabogal, Vanoss Marin, Otero-Sabogal, & Perez-Stable, 1987). Some studies include the three dimensions, while others only use a subset of them. Typically, multiple linguistic acculturation dimensions are averaged to form a single linguistic acculturation index (Salamonson, Everett, Koch, Andrew, & Davidson, 2008). There is good reason to expect that the multiple contexts of language use—family, friends, and media—may relate to substance use and other behaviors in distinctive ways, perhaps independently of each other (Nieri, 2007). Because immigrant parents usually become fluent in English at a slower pace than their children, children may continue to speak Spanish with their parents but increasingly speak English with friends (Portes & Rumbaut, 2001; Santisteban & Mitrani, 2003). Speaking a language other than the language of origin among friends has been found to be a predictor of increased exposure to networks with prodrug norms (Weisskirch, 2007).

Media exposure may play a different acculturative role than language use with friends and family. Many metropolitan areas with sizeable immigrant communities, such as Phoenix, Arizona, can sustain locally produced Spanish language media in print, radio, and television (Portes & Rumbaut, 2001). Child-oriented programming, such as cartoons, however, is still likely to be more plentiful in English-language media (Nieri, 2007; Rios, 2003).

Gender Differences

Research with older children and teens generally finds that boys have higher rates of drug initiation and use. For example, a study conducted in the Southwest United States with a sample of seventh-grade Latino students found that boys have a higher frequency of use of alcohol, marijuana, and cigarettes than girls (Kulis, Yabiku, Marsiglia, Nieri, & Crossman, 2007). Similarly, a study with Mexican youths aged 11 to 21 observed higher rates of initiation of alcohol and tobacco use for boys compared to girls (Wagner, Velasco-

Mondragón, Herrera-Vázquez, Borges, & Lazcan-Ponce, 2005). Another study with a predominantly Mexican American eighth-grade population, however, reported that girls had higher levels of alcohol and inhalant use than boys (Tonin, Burrow-Sanchez, Harrison, & Kircher, 2008). The last study administered the survey only in English, a fact that may explain the conflicting findings as lower acculturated Spanish monolingual students were not able to participate.

It is likely that gender differences are contingent on the age of the subjects. The nationally representative *Monitoring the Future* Report (Johnston et al., 2005) reports that U.S. boys in 12th grade have higher levels of alcohol, marijuana, and other illegal drug use, but other studies have found few gender differences at younger ages (Kulis, Marsiglia, Lingard, Nieri, & Nagoshi, 2008). Larger gender differences among older youth have also been found in Mexican studies. In a northern Mexico study, middle school males reported higher rates of lifetime prevalence of tobacco and alcohol, but by the time they were in high school the differences had widened significantly (Floyd, Latimer, Vasquez, & O'Brien, 2005). This suggests that there is a strong developmental pattern to gender differences that becomes more pronounced over time as children enter puberty, deepen their gender roles, and perhaps even differentiate at the physiological level. The fact that this pattern appears in both United States and Mexico-based samples indicates the need to investigate the possible intersection of culturally, gendered, and developmentally explicit trajectories.

Although there is tremendous variability at the individual level, population-based patterns generally find that gender-based differentials in substance use are larger for individuals of Mexican descent compared to non-Latino Whites (Kulis et al., 2008). Mexican studies show that Mexican women are more likely to be abstainers than men, consume less than men when they do drink, and have fewer alcohol-related problems (Slone et al., 2006). Greater protectiveness of girls in some Mexican heritage families often leads to more parental monitoring, lower permissiveness, and thus lower levels of substance use for girls compared to boys at all ages (Crosnoe, Erickson, & Dornbusch, 2002; Voisine, Parsai, Marsiglia, Kulis, & Nieri, 2008).

Differences in the configuration of peer networks and substance use networks may also contribute to gender differences in substance use. Peer networks are important influences on children's substance use behaviors, yet children's networks can differ substantially by gender (Ennett et al., 2006; Hawkins, Catalano, & Miller, 1992; Henry & Kobus, 2007; Kaplan, Nápoles-Springer, Stewart, & Pérez-Stable, 2001). The gender composition of peer groups is more segregated for younger children than for older children and adolescents, suggesting that gender roles and identities are important factors to consider even for preadolescent children (Strough & Covatto, 2002).

Latinas are more concerned about controlling their weight than Latino boys (Ayala, Miken, Galindo, & Elder, 2007; Zucker et al., 2001) and they use cigarettes for their appetite-suppressing function more than boys do (Fulkerson & French, 2003). The influence of media messages has been identified as being closely associated with cigarette initiation among Latina girls in the U.S.-Mexico region (Chalela, Velez, & Ramirez, 2007).

The patterns of drug use reported by a Southwest Mexican heritage adolescent sample were correlated with their gender identity. A strong sense of masculinity and risk taking was strongly associated with boys' use of marijuana and hard drugs, suggesting that these substances are highly linked to gender, gender roles, and peer groups (Kulis, Marsiglia, & Hecht, 2002). Similar patterns were found in a high school-based sample in northern Mexico (Monterrey), where masculinity and risk taking was associated with higher drug use as well as higher prodrug intentions, norms, expectancies, and offers (Kulis et al., 2008). Risk

taking underlies much of illegal drug activity, especially drug dealing, which is a context that is permeated with hegemonic masculinity (Hutton, 2005). Comparable binational results point to deeply rooted associations between the gendered peer contexts of substance use among youth on both sides of the border. Boys' social and peer networks are likely to place them at higher risk of substance use, especially for illegal drugs such as marijuana, which entail greater risk taking and sensation seeking (Stephenson & Helme, 2006).

Substance Use and Availability Among Preadolescents

Findings from the 2007 *Monitoring the Future* Report confirm that the most commonly used substances among children and youth in the United States are alcohol, tobacco, and marijuana, with 72% of all students reporting that they had consumed alcohol, 46% reporting that they have tried cigarettes, and 32% that they have tried marijuana by the time they reach their senior year in high school (Johnston, O'Malley, Bachman, & Schulenberg, 2008). These rates may be underreported among certain subgroups of children and youth due to the high drop-out rates experienced by members of some subpopulations such as Latinos (National Council of La Raza, 2007). Latinos tend to fall in between African Americans—the group with the lowest use rates—and Whites—the group with the highest use rates (Johnston et al., 2008). The use rates for alcohol and tobacco do not significantly differ by gender, but boys tend to report higher use rates as they get older and they appear to start using marijuana before girls do (Johnston et al., 2008). Although there is limited information about age of initiation among children of various ethnic groups, researchers leading the *Monitoring the Future* Report hypothesize that Latino children may be more precocious in their initiation into certain substances than children from other ethnic and racial groups (Johnston, et al., 2008).

Patterns of inhalant use appear to be different than for other substances such as alcohol, cigarettes, and marijuana. Inhalants are often more easily obtained by younger children and children of lower socioeconomic status because they do not need to purchase them and may be able to access them within their family and neighborhood contexts. Inhalants are grouped into four types: volatile solvents, aerosols, gases, and nitrites (Medina-Mora & Real, 2008). In some cases inhalants are more easily accessible to females than males (e.g., nail polish remover). Younger Latinas have reported an increase in inhalant use; in some studies female respondents surpass the inhalants use rate of their male counterparts (Beauvais, Wayman, Jumper-Thurman, Plested, & Helm, 2002; Tonin et al., 2008).

Unlike many other drugs, the use of inhalants tends to occur at an early age. Previous studies have found that peak initiation rates generally occur in Grades 6 through 9, with 5.6% of eighth graders reporting that they had already tried inhalants by the end of the fifth grade (Sakai, Hall, Mikulich-Gilbertson, & Crowley, 2004). Inhalant use declines as adolescents get older; 8th-grade students on average report inhalant use at rates 2% to 3% higher than 10th-grade students, who in turn report inhalant use at rates 2% higher than 12th-grade students (Johnston, O'Malley, Bachman, & Schulenberg, 2006). These declines may be due to attrition more than to actual declines in use rates as inhalant users may have a greater probability of dropping out of school than nonusers (Sakai et al., 2004).

There is some evidence that lower linguistic acculturation (i.e., more frequent use of Spanish language) may predict higher inhalant use among Mexican heritage preadolescents (Tonin et al., 2008). Such findings challenge the prevailing assumption about the protective effects of Spanish language use or lower linguistic acculturation among Mexican heritage children (Marsiglia & Waller, 2002). Conversely, greater linguistic acculturation toward English language use might be protective with regard to inhalants and other substances.

Studying inhalant use among a Mexican heritage population of students also raises culturally specific and national origin considerations. Many of the Mexican heritage students in central Phoenix are first-generation immigrants who were born in Mexico. When Mexican children come to the United States, they bring with them the information, norms, and experiences from their country of origin.

In Mexico, inhalants are the drug of choice for disadvantaged children (National Institute on Drug Abuse, 2000). And while lifetime prevalence of inhalant use is higher in the United States, daily use—although very infrequent—is higher in Mexico than in the United States. (National Institute on Drug Abuse, 1995). These reported higher rates of use among Mexican heritage youth, however, have not been consistently found in U.S.-based studies. While some research suggests that inhalant use is higher among Mexican heritage children and youth than for non-Latino Whites (Edwards et al., 2007; Padilla, Padilla, Morales, Olmedo, & Ramirez, 1979), other research reports little difference between these subgroups in the United States. (Beauvais et al., 2002).

Even though prevalence and rates of use may be similar across ethnic groups, there is still reason to believe that the pathways to use may be different. For example, a study focusing on peer influences found that while peer influences were significant predictors of inhalant use for non-Latino White and Mexican heritage youth, peer influences were stronger for non-Latino Whites (Beauvais et al., 2002). This suggests that the mechanisms behind inhalant use may operate differently for Mexican heritage youth, especially when the processes of immigration and acculturation are considered.

Although research consistently finds that acculturation of Latino youth to U.S. society is associated with higher levels of substance use, inhalants are unique in that some studies have reported the opposite trends. A transnational study examined Mexican youth before, during, and after they migrated to the border region or the United States and found that inhalant use rates decreased after migration (Sanchez-Huesca et al., 2006). Similarly, other studies conducted with Mexican heritage adolescents found no association between acculturation and inhalant use (Barrett et al., 1991; Tonin et al., 2008).

Ecodevelopmental theory posits that as children mature, their networks and contexts of development expand (Schwartz, Pantin, Coatsworth, & Szapocznik, 2007; Szapocznik & Coatsworth, 1999). From this perspective, this article examines the possible relationships between substance use initiation, linguistic acculturation, and gender in a Mexican heritage middle-childhood sample ($N = 1,473$) from 30 public schools in Phoenix, AZ. The overarching hypothesis guiding the study was that linguistic acculturation and gender affect drug use initiation of Mexican heritage preadolescents in unique ways. This expectation was explored using discrete-time event history methods that model the rate at which non-substance-using children initiate use of different substances from fifth through eighth grade. Several questions were addressed: (a) whether linguistic acculturation was as relevant a factor in substance use initiation for youth in middle childhood as it is for older youth (Wagner et al., 2008); (b) whether the different contexts in which linguistic acculturation occurs for youth—their family, peers, and media outlets—are related to substance use initiation to different degrees; (c) whether linguistic acculturation in middle childhood predicts initiation of some substances but not others; and (d) whether all these relationships vary by the gender of the child.

Competing hypotheses were proposed as an attempt to address contradictory findings and to extrapolate existing research findings to a younger age group where acculturation, parental influence, and peer processes may be very different. Given the extensive literature showing links between acculturation and substance use, it was expected that linguistic acculturation

was associated with higher rates of substance use initiation. Complexities in this expectation, however, were introduced by the young age of the study population, the multiple dimensions of linguistic acculturation, and multiple substances. The well-established associations between linguistic acculturation and substance use may be quite different for inhalants, which have patterns of use very different from cigarettes, alcohol, and even marijuana. It was predicted that inhalants would be the drug of choice for some of these younger Mexican heritage children in the borderlands but, because peer groups and majority culture norms are less accepting of inhalant use, it may be that greater linguistic acculturation toward friends might be protective against the initiation of inhalants.

With regard to gender it was expected that ecodevelopmental risk factors for substance use would have stronger effects for boys than girls. This expectation was based on the higher rates of substance use for boys than girls as well as other risk-taking attitudes and behaviors associated with the gender identities of boys and their peer networks.

Method

This a secondary data analysis study, using the archival data from a randomized trial of a substance use prevention program for fifth-grade students in 30 public schools in the Phoenix, AZ, metropolitan area. Several of the authors of this article were involved in the design and implementation of the original trial. The study enrolled 2,034 fifth graders at baseline in the fall of 2004, with follow-up interviews at five intervals. The baseline data collection was obtained before the randomized trial and measured items including use of alcohol, cigarettes, marijuana, and inhalants. Items were repeated in subsequent waves of the survey in order to track their changes over time. This analysis used five waves of data, which were collected twice during the 1st year, once during the 2nd year, and twice during the 3rd year, from the beginning of fifth through the end of seventh grade.

Because this secondary data analysis study focused on the acculturation processes, the sample was restricted to the Mexican heritage students, a group that comprised 80% of the total sample (1,632 of 2,034). Although students of all races, ethnicities, and cultures are constantly changing and reevaluating their identities, these processes are extremely diverse and heterogeneous. Measures and theories appropriate for one group may not have validity or relevance to another group, and the acculturation process may be qualitatively different across national origin groups. To model substance use initiation, the analysis was also restricted to students who had not yet begun using substances, a group that constituted a large majority of the sample at the start of fifth grade. Therefore, to focus the analysis and to ensure the relevance of the measures, the analysis of initiation included only nonusing students of Mexican heritage. That number varied by substance: 1,147 for alcohol, 1,429 for cigarettes, 1,473 for marijuana, and 1,386 for inhalants.

Alcohol, Cigarette, Marijuana, and Inhalant Initiation

The dependent variables of interest were the rates of initiation of alcohol, cigarettes, marijuana, and inhalants. Because the surveys asked students at each wave if they ever used these substances, it allowed for a determination of the approximate timing of students' first use. Multiple questions were used to determine use, employing questions that were developmentally appropriate for this age group as shown in other studies of early adolescent drug use (Flannery, Vazsonyi, Torquati, & Fridrich, 1994). Lifetime use questions asked if the students ever used the substances ("Which of the following have you tried, even if it was only once or only a little?"). Additional questions in the survey asked, "How many times have you (drunk more than a sip of alcohol; smoked cigarettes; smoked marijuana; sniffed glue ... or other inhalants) in the past 30 days" and the amount of past 30-day use (number of "alcohol drinks," cigarettes, and "hits of marijuana.") Use of lifetime and recent

substance use frequency and amount measures is appropriate for such young respondents, averaging only 10 years old at baseline. Their responses could be subject to desirability bias, question misunderstanding, and inability to see logical inconsistencies. Multiple questions were used to designate the time of first use as indicated by an admission of use on any of the measures. At each wave after baseline, substance use was measured as a dummy variable (no use vs. any use), with separate items for each substance.

Linguistic Acculturation

Multiple indicators of linguistic acculturation were used to measure three distinct domains: family, friends, and media. Youths were asked, “What language do you usually speak when talking with family members?” “What language do you usually speak with friends?” and “What language do you usually listen to when watching TV, or listening to the radio or to music?” Responses were (a) Spanish only, (b) mostly Spanish, (c) both Spanish and English, (d) mostly English, and (e) English only. Measurement of linguistic acculturation occurred at the baseline wave and was used to predict the rate of substance use initiation in the following four waves.

Gender

Substance use levels greatly differ by gender (Griesler & Kandel, 1998; Warner, Kessler, Hughes, Anthony, & Nelson, 1995). In addition, there are several good reasons to believe that processes of initiation vary for boys and girls. Given these large differences, separate analyses were conducted by self-reported gender.

Control Variables

Although the primary interest of this study was to investigate the relationship between substance use initiation rates and linguistic acculturation, additional measures were included in the analyses as controls to guard against spurious associations. Self-reported grades were assessed with the question, “What grades do you usually get in school?” Responses were an ordinal score from 1 to 9, with the highest response being “Mostly A’s” and the lowest response being “Mostly F’s.” The students’ usual grades is an important control variable that represents educational attachment, and grades have been shown to have association with delinquency, deviance, and rule-breaking behavior.

Free or reduced lunch status under the Federal school lunch program was included as a proxy for socioeconomic status. Young children often cannot report reliably more specific measures of their parents’ social class, occupation, education, or income. Asking students to report these answers would likely yield low-quality data with high measurement error and missing values. Other research has found that free or reduced lunch status is a reasonable proxy of parental socioeconomic status (Bankston & Caldas, 1996; Gerard & Buehler, 1999). This variable was coded as 1 if the student received a free or reduced lunch and 0 otherwise.

A final control was a treatment program indicator. Schools were randomly assigned to a treatment or control condition. All students in the same school received the same condition. The schools in the control condition continued with their existing state-mandated substance use prevention programming, which varied from school to school. Schools in the treatment condition, however, received a fifth-grade-modified version of the *keepin’ it REAL* substance use prevention program, a culturally grounded and SAMHSA model program designed for seventh- and eighth-grade students (Gosin, Marsiglia, & Hecht, 2003; Marsiglia & Hecht, 2005). Because the purpose of the current analysis is not to assess this intervention, treatment was considered only as a control variable, with a dichotomous indicator coded 1 for treatment, and 0 for control.

Methods of Analysis

Discrete-time event history analysis (Allison, 1995) was used to estimate the relationship between the independent variables and the rate of initiation of the different substances. Discrete-time event history models have been successfully used in prior analyses of substance use transitions (Guo, Hill, & Hawkins, 2002; Kulis, Nieri, Yabiku, Stromwall, & Marsiglia, 2007; Masse & Tremblay, 1997; Wilcox, Wagner, & Anthony, 2002). The discrete-time event history models are estimated using logistic regression techniques, which can be conceptualized as a generalized linear model with a logit link function. Allison (1982) has shown that the likelihood for the discrete-time model is equivalent to a logistic regression model with varying numbers of observations per respondent.

The unit of analysis was the person-wave. For each wave in which the student has not yet initiated use of the substance, the dependent transition indicator was coded 0. At the wave of first use of a particular substance, the indicator was coded 1, and the student no longer contributed observations to the dataset. Note that students who were already users at the baseline survey in fall 2004 were removed from the analysis because their initiation had already occurred.

The analyses took into consideration two additional methodological issues: clustered data and missing data. Clustered data was addressed with multilevel modeling techniques (Raudenbush & Bryk 2002) in the form of random intercepts. These models allow for the possibility that students in the same school have a shared average school baseline (or intercept) level of initiation rates, but these baseline rates may vary for each school. Missing data was addressed with multiple imputation (Allison, 2002). From the observed data 10 complete datasets were created. These complete datasets were analyzed using regular methods, and the results of each of the analyses were properly combined to reflect the uncertainty in the imputed values. The data analysis used SAS 9.1 (2007). The GLIMMIX procedure estimated the models, and the MI and MIANALYZE procedures imputed the data and performed the multiple imputation inferences.

In sum, the model we estimate can be expressed as

$$\text{logit}(p_{ijt}) = \beta_{0j} + \beta_1 S_{ijt} + \beta_2 T_{ijt} \quad (1)$$

for student i in school j in wave t , where $p_{ijt} = P[Y_{ijt} = 1 | S_{ijt}, T_{ijt}]$; Y_{ijt} is 1 if student i in school j experiences an initiation event in wave t , and 0 otherwise; β_{0j} is the intercept, which is allowed to vary randomly across the j schools, β_1 and β_2 are vectors of coefficients. S_{ijt} is a vector of student traits. T_{ijt} is a specification for the baseline hazard, parameterized by a series of dummy variables (Allison 1982). An additional equation specifies the random component of the model,

$$\beta_{0j} = \gamma_{00} + \mu_{0j} \quad (2)$$

where γ_{00} is the common intercept across all the schools, and μ_{0j} is the unique deviation of each of the j schools from the common intercept.

Results

Table 1 presents descriptive statistics for the sample. Because analyses were conducted separately by gender, the information is presented separately for boys and girls. Because the

four substances were modeled separately by gender, four different datasets were generated for each sex: there was a separate event history file for boys' alcohol initiation, for boys' cigarette initiation, and so on. The datasets had the same independent variables, but different dependent variables. The mean statistics for acculturation and the controls, therefore, were averaged across the four datasets for each sex. The four data-sets for each sex, however, were very similar. For example, for boys the mean language use with family is 2.92, 2.94, 2.94, and 2.94 in the datasets for the initiation of alcohol, cigarettes, marijuana, and inhalants (separate means for each dataset not shown in table). The mean in Table 1 is 2.94. Thus the averaged descriptive statistics for linguistic acculturation and the controls are an accurate reflection of the multiple datasets.

The means in the table illustrate both gender similarities and differences. Of the students who are alcohol nonusers at the start of the study, similar percentages of boys and girls become users (slightly more than 40%). Similar proportions also use inhalants for the first time (17% of boys and 20% of girls). Differences begin to emerge with cigarettes and marijuana, with boys having higher initiation than girls: about 7% higher for cigarettes and 6% higher for marijuana.

The patterns of linguistic acculturation show that for both sexes, language use with family is the least linguistically acculturated domain. In addition, for each domain, boys have higher levels of linguistic acculturation than girls do. This pattern is consistent with prior findings that suggest boys acculturate more rapidly than girls (Szapocznik & Kurtines, 1993). This may be related to the more protective parenting that Mexican heritage girls receive or traditional gender roles that require more home involvements and less time to socialize with broader non-Latina networks (Crosnoe et al., 2002; Voisine et al., 2008).

With regard to control variables, there is little difference by gender in the proportion receiving free or reduced lunches. The high proportion of free or reduced lunches among boys and girls, 92% and 94%, reflects the overall level of economic disadvantage in this population. By comparison, the U.S. average for receiving free or reduced-price school lunches in 2004 was 58% (U.S. Department of Agriculture, 2008). There is no gender difference in participation in the prevention program, and this is expected due to the study's random assignment. Finally, there is a tendency of girls to report higher grades than boys. Girls average a little more than 7 on the ordinal scale, which corresponds to "mostly B's." Boys report slightly lower usual grades.

Tables 2 through 5 present the multivariate discrete-time event history models, estimated separately for boy and girls. The results are presented as odds ratios, which are the exponentiated logistic regression coefficients. These coefficients are multiplicative: a coefficient greater than 1.0 represents a positive effect on the rate—an effect that increases initiation and causes students to use at earlier ages. In contrast, a coefficient less than 1.0 is a negative effect—an effect that decreases the rate of initiation and delays onset. Coefficients that are not significantly different from 1.0 are null effects that do not influence the rate of initiation. Note that although the discrete-time model estimates the effects of predictors on the odds of initiation, the outcome is described as a rate. This is because when the number of observations is larger relative to the number of events, the odds and rates converge and are essentially equivalent.

Table 2 shows the results for alcohol initiation. For each of the three measures of linguistic acculturation (family, friends, and media), a pair of models is estimated: one model for boys and one for girls. An additional column next to each pair of models indicates (&) if the coefficients differ significantly for boys and girls at the $p < .05$ level. The determination of significant difference in the coefficients came from a fully interactive model using data from

the combined sample of boys and girls in which all predictors were interacted with gender (full results not shown in the table).

The results for Models 1 through 6 show that none of the linguistic acculturation measures is significantly associated with alcohol initiation rates. The only significant predictors in these model are free or reduced lunch status ($p = .0004$ in Model 1), which is significantly more protective against alcohol initiation for boys than girls. Higher reported usual grades in school are also protective for boys ($p = .0554$ in Model 1).

Table 3 examines the rate of cigarette initiation. In Models 1 through 5, none of the linguistic acculturation measures are significantly associated with cigarette initiation for boys or girls. Model 6, however, provides some evidence that greater linguistic acculturation with media is a significant risk factor for girls ($p = .0645$). For each one-unit increase of linguistic acculturation with media, the rate of cigarette initiation increases by 18%. For boys, higher school grades continues to be protective in all models ($p = .0125$ in Model 1).

Table 4 shows the results for the rate of marijuana initiation. In Model 1, linguistic acculturation with family is significantly ($p = .0006$) and positively associated with higher rates of initiation for boys. This effect of linguistic acculturation with family is significantly greater than the coefficient for girls ($p = .0336$). Recall that the linguistic acculturation measures are coded such that higher values represent more English-language dominance in each domain. For example, consider the coefficient of 1.33 for linguistic acculturation with family. Each one unit increase on this scale toward English-language dominance is associated with a 33% increase in the rate of marijuana initiation ($1.33 - 1.00 = 0.33$ or 33%). Among boys, coefficients for linguistic acculturation with friends and media are similar in magnitude (1.20 and 1.27) and statistically significant ($p = .0469$ and $p = .0112$). The coefficient for linguistic acculturation with friends is a significantly greater risk factor for boys than girls ($p = .0467$). As with alcohol and cigarette initiation, usual grades emerge as a protective factor against marijuana initiation for boys ($p = .0174$ in Model 1).

Table 5 examines inhalant initiation rates. The only linguistic acculturation measure that is significantly associated with initiation is language spoken with friends ($p = .0509$ for boys, $p = .0235$ for girls). The direction of this effect, however, is different than the findings in Tables 2 through 4 regarding linguistic acculturation and substance use initiation. For boys, each one unit increase toward English-language dominance is significantly associated with a reduction in the rate of inhalant initiation by 16% ($1 - 0.84 = 0.16$, or 16%). The effect for girls is slightly larger (a 17% reduction), but these coefficients do not vary significantly by gender. In other words, linguistic acculturation with friends is a protective factor with regard to inhalants. Unlike all other substances, usual school grades are not a significant predictor of boys' initiation of inhalants.

Discussion

Although there is an established literature documenting the relationships between linguistic acculturation and substance use among Latinos, much of this literature rests upon studies of adolescents, teens, and adults. Fewer studies have tested if these relationships operate in similar ways for younger samples, such as Latino youth in middle childhood. The contribution of this article has been to test these relationships with a sample of Mexican heritage children using multiple measures of linguistic acculturation and different substance use outcomes. The results partially confirm Hypotheses 1 and 2, suggesting that linguistic acculturation and substance use share complex relationships in this young Mexican heritage population in the borderlands. These associations are contingent on gender and the specific substance.

The results are most consistent with past findings on cigarettes use for girls and marijuana use for boys. Among girls, linguistic acculturation in the domain of media is associated with higher rates of cigarette initiation. The fact that this result holds only for girls and only for cigarettes strongly points to gender-specific explanations. Preadolescence is a time when girls are becoming more conscious of their bodies and gendered expectations of appearance and thinness. Media is one of the key contexts in which images of thin female body expectations are promoted. Because nicotine in cigarettes has appetite-suppressing properties, it is not surprising that greater linguistic acculturation would be associated with higher rates of smoking initiation among girls with more exposure to media messages promoting cigarette use as a weight control strategy (Jessen, Buemann, Toubro, Skovgaard, & Astrup, 2005). More specific research is needed regarding Mexican heritage girls and what triggers their initiation into cigarettes at different stages of their linguistic acculturation process.

For boys, all forms of linguistic acculturation were associated with higher rates of marijuana initiation. These results, too, suggest gender-specific explanations (Hypothesis 2). Research shows that negative masculine gender identities tend to increase boys' substance use, especially for illicit drugs like marijuana (Kulis et al., 2002, 2008). In addition, because boys have lower levels of parental monitoring than girls, linguistic acculturation may place them at greater risk for illicit drug use (Crosnoe et al., 2002; Voisine et al., 2008). Unlike acculturating girls, boys may not experience the same level of parental influence to offset their increasing exposure to prodrug peers and prodrug norms.

The two findings that diverge from prior research are for alcohol and inhalants. For both boys and girls, none of the linguistic acculturation measures predicted alcohol initiation rates. Several prior studies show that linguistic acculturation is a risk factor for alcohol use, at least among older children, teens, and adults (Vega & Gil, 1998). For boys and girls, linguistic acculturation with friends significantly predicted inhalant initiation, yet the direction of this effect was contrary to much of the prior literature on acculturation and substance use. These findings confirm recent findings that greater linguistic acculturation among Mexican heritage children may be protective against inhalant use (Tonin et al., 2008). In future research on the reasons for this relationship, it may be important to consider how social integration into networks of more acculturated peers affects inhalant use in ways that differ from use of other substances. It would be useful to explore whether more acculturated youth may be more aware of, or concerned about, the potential harm of inhalant use than are less acculturated youth, and/or whether they promote other forms of substance use instead of inhalant use.

Although unexpected, the findings for inhalant use appear more understandable when the specific population, age group, and substance are considered. While use of different substances is certainly linked, substances have different, often nonoverlapping etiologies. Compared to users of alcohol, cigarettes, and marijuana, inhalant users often have distinct profiles that differentiate them from other children. Inhalants have lower peer acceptance than more commonly used substances. Especially relevant to Mexican heritage communities in the borderlands is the evidence that suggests inhalant use may be more prevalent, easily accessible and, in some cases, have more peer acceptance in Mexico than in the United States. Thus, as children acculturate into English-speaking peer networks, acceptance of inhalant use may decline. Similar beneficial health outcomes have also been found in a limited number of related studies (Borges et al., 2006; Zemore, 2007). The results of the present study from an ecodevelopmental perspective add to the emerging literature suggesting that the effects of linguistic acculturation among Latinos may not always be uniform but are contingent on the context of substance use: age, gender, national origin, and the specific substance used.

The findings reported in this article have direct practice and prevention science implications for preadolescent Mexican heritage and other youth. They suggest that universal prevention interventions for ethnic minority youth need to be tailored to their gendered linguistic acculturation trajectories. Biculturalism may emerge as a desired outcome for children as they navigate the complex waters of acculturation. With some specific substances such as inhalants, acculturation can be protective, while in most cases hasty and unsupported acculturation can be a risk factor for substance use. These processes appear to be gendered among Mexican heritage preadolescents. Advancing knowledge about the specific health assets and vulnerabilities of boys and girls can greatly strengthen the effectiveness of prevention interventions with this group.

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Table 1

Descriptive Statistics

	Boys				Girls			
	<i>M</i>	<i>SD</i>	Range	<i>N^a</i>	<i>M</i>	<i>SD</i>	Range	<i>N^a</i>
Initiated alcohol	0.434	0.496	0–1	525	0.423	0.494	0–1	622
Initiated cigarettes	0.238	0.426	0–1	665	0.174	0.379	0–1	764
Initiated marijuana	0.181	0.389	0–1	695	0.122	0.327	0–1	778
Initiated inhalants	0.170	0.376	0–1	659	0.198	0.400	0–1	727
Linguistic acculturation								
Language use with family	2.936	1.229	1–5	695	2.847	1.179	1–5	778
Language use with friends	3.851	1.134	1–5	695	3.690	1.105	1–5	778
Language use in media	3.910	1.120	1–5	695	3.575	1.062	1–5	778
Control variables								
Free or reduced lunch	0.919	0.273	0–1	695	0.941	0.236	0–1	778
Usual grades	6.674	1.900	1–9	695	7.135	1.673	1–9	778
Prevention program	0.699	0.459	0–1	695	0.704	0.456	0–1	778

^a*N*s for substance use initiation variables are the number of cases at baseline that had never used the particular substance. *N*s for other variables reflect the largest number of cases used in analyses predicting initiation of the four substances. Means and standard deviations for linguistic acculturation and control variables are weighted averages from the separate samples of baseline nonusers of alcohol, cigarettes, marijuana and inhalants.

Table 2

Linguistic Acculturation and Rate of Alcohol Initiation

	Model 1 boys	Model 2 girls	Model 3 boys	Model 4 girls	Model 5 boys	Model 6 girls
Linguistic acculturation						
With family	1.06 (0.93)	1.07 (1.04)				
With friends			1.00 (−0.05)	0.97 (−0.49)		
With media			1.01 (0.15)	1.04 (0.57)		
Control variables						
Free or reduced lunch	0.43 ^{*****} (−3.54)	1.04 ^{&} (0.14)	0.42 ^{*****} (−3.62)	1.00 ^{&} (0.00)	0.42 ^{*****} (−3.65)	1.02 ^{&} (0.08)
Self-reported grades	0.93 [*] (−1.92)	0.97 (−0.71)	0.93 [*] (−1.90)	0.98 (−0.55)	0.93 [*] (−1.90)	0.97 (−0.64)
Prevention program	1.14 (0.79)	1.06 (0.35)	1.16 (0.91)	1.05 (0.30)	1.16 (0.91)	1.05 (0.29)

Note:

“&” in final columns denotes significant difference ($p < .05$) in coefficients between boys and girls. Coefficients are odds ratios, with t -statistics in parentheses.*
 $p < .10$.**
 $p < .05$.***
 $p < .01$.****
 $p < .001$, two-tailed tests.

Table 3**Linguistic Acculturation and Rate of Cigarette Initiation**

	Model 1 boys	Model 2 girls	Model 3 boys	Model 4 girls	Model 5 boys	Model 6 girls
Linguistic acculturation						
With family	1.03 (0.42)	1.10 (1.26)				
With friends			0.90 (-1.40)	0.91 (-1.16)		
With media					1.06 (0.81)	1.18* (1.85)
Control variables						
Free or reduced lunch	0.80 (-0.78)	1.24 (0.54)	0.74 (-1.04)	1.13 (0.30)	0.80 (-0.79)	1.25 (0.54)
Self-reported grades	0.90** (-2.50)	0.92 (-1.48)	0.90** (-2.52)	0.93 (-1.34)	0.90** (-2.50)	0.92 (-1.46)
Prevention program	1.28 (1.30)	0.90 (-0.47)	1.31 (1.43)	0.89 (-0.49)	1.28 (1.32)	0.89 (-0.52)

Note: There were no significant differences ($p < .05$) in coefficients between boys and girls. Coefficients are odds ratios, with t -statistics in parentheses.

* $p < .10$.

** $p < .05$.

*** $p < .01$.

**** $p < .001$, two-tailed tests.

Table 4

Linguistic Acculturation and Rate of Marijuana Initiation

	Model 1 boys	Model 2 girls	Model 3 boys	Model 4 girls	Model 5 boys	Model 6 girls
Linguistic acculturation						
With family	1.33 **** (3.44)	1.04 [‡] (0.41)				
With friends			1.20 ** (1.99)	0.93 [‡] (−0.69)		
With media					1.27 ** (2.54)	1.17 (1.51)
Control variables						
Free or reduced lunch	1.01 (0.04)	1.25 (0.47)	0.95 (−0.17)	1.19 (0.36)	0.93 (−0.23)	1.27 (0.51)
Self-reported grades	0.89 ** (−2.38)	1.02 (0.29)	0.90 ** (−2.19)	1.02 (0.35)	0.90 ** (−2.30)	1.02 (0.25)
Prevention program	1.06 (0.22)	1.17 (0.62)	1.12 (0.44)	1.17 (0.60)	1.12 (0.47)	1.16 (0.58)

Note:

“[‡]” in final columns denotes significant difference ($p < .05$) in coefficients between boys and girls. Coefficients are odds ratios, with t -statistics in parentheses.

*

 $p < .10$.

**

 $p < .05$.

 $p < .01$.

 $p < .001$, two-tailed tests.

Table 5

Linguistic Acculturation and Rate of Inhalant Initiation

	Model 1 boys	Model 2 girls	Model 3 boys	Model 4 girls	Model 5 boys	Model 6 girls
Linguistic acculturation						
With Family	0.97 (-0.35)	1.04 (0.46)				
With Friends			0.84* (-1.95)	0.83** (-2.27)		
With Media					1.02 (0.27)	0.98 (-0.29)
Control variables						
Free or reduced lunch	1.10 (0.26)	0.90 (-0.29)	1.03 (0.08)	0.83 (-0.53)	1.12 (0.30)	0.89 (-0.35)
Self-reported grades	0.94 (-1.29)	0.99 (-0.21)	0.93 (-1.34)	1.00 (-0.02)	0.94 (-1.29)	0.99 (-0.17)
Prevention program	1.09 (0.38)	1.40 (1.42)	1.09 (0.36)	1.40 (1.37)	1.08 (0.36)	1.40 (1.43)

Note: There were no significant differences ($p < .05$) in coefficients between boys and girls. Coefficients are odds ratios, with t -statistics in parentheses.

*
 $p < .10$.

**
 $p < .05$.

 $p < .01$.

 $p < .001$, two-tailed tests.