

TRAJECTORIES OF ACCULTURATION AND ENCULTURATION IN RELATION TO HEAVY EPISODIC DRINKING AND MARIJUANA USE IN A SAMPLE OF MEXICAN AMERICAN SERIOUS JUVENILE OFFENDERS

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This study examines the longitudinal relations of multiple dimensions of acculturation and enculturation to heavy episodic drinking and marijuana use in a sample of 300 male, Mexican-American, serious juvenile offenders. We track trajectories between ages 15 and 20 and also consider the effects of participants' time spent residing in supervised settings during these years. Results showed some (although not entirely consistent) support for the hypothesis that bicultural adaptation is most functional in terms of lowered substance use involvement. The current findings demonstrate the importance of examining these relations longitudinally and among multiple dimensions of acculturation and enculturation, and they call into question simple models that suggest that greater acculturation is associated with greater substance use among Mexican-American adolescents.

INTRODUCTION

Individuals of Mexican heritage are the largest subgroup (i.e., 58.5%) of the Hispanic population and one of the fastest growing segments of the U.S. population. This rapidly growing subgroup is also relatively youthful compared to the general U.S. population (U.S. Census Bureau, 2001), which means that large numbers of Mexican/Mexican-American adolescents are being confronted by dual cultural

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adaptation challenges that arise from being members of an ethnic minority group within the mainstream U.S. These challenges include learning the host culture's language, rules, values, and traditions, during a period of their lives that is considered to be normatively challenging (Steinberg, in press).

Adolescence has been characterized as a turbulent period during which a central task is ego identity development (Compas, Davis, Forsythe, & Wagner, 1987; Erickson, 1968; Marcia, 1980). However, Mexican-American adolescents undertake also to develop an "ethnic identity" (Phinney, 1989, 1990) amid the torrent of information on norms, values, and expectations of the host cultural environment. Indeed, Mexican-American adolescents are obliged to integrate views about the self, the family, and the community, which they learned from their parents and other sources of socialization from the ethnic culture, with the often contradictory views put forth by socialization agents from the mainstream culture. Hence, these adolescents are particularly vulnerable as they strive (or not) to live up to more than one set of cultural standards and expectations. These dual cultural adaptation processes are referred to as acculturation (i.e., adaptation to the mainstream culture) and enculturation (i.e., adaptation to the ethnic culture). The processes may place Mexican American adolescents at risk for a variety of negative outcomes (Gonzales & Kim, 1997; Gonzales, Knight, Morgan-Lopez, Saenz, & Sirolli, 2002; Vega & Gil, 1999) including alcohol and drug abuse.

Alcohol and illegal drug use among adolescents in general are serious social and public health concerns because they are associated with delinquent activities (Huizanga, Loeber, Thornberry, & Cothorn, 2000), academic failure (Arellano, Chavez, & Deffenbacher, 1998; Beauvais, Chavez, Oetting, Deffenbacher, & Cornell, 1995; Chavez, Edwards, & Oetting, 1989; Fagan & Pabon, 1990; Mensch & Kandal, 1988; Vega, Khoury, Zimmerman, Gil, & Warhaheit, 1995), risky sexual behavior (Centers for Disease Control and Prevention [CDC], 2006; Krohn, Lizotte, & Perez, 1997), impaired driving (Turrisi & Jaccard, 1992; Saffer & Grossman, 1987), and later substance abuse or dependence diagnoses (Grant & Dawson, 1997; Hawkins, Catalano, & Miller, 1992; Hawkins, Graham, Magun, Abbott, Hill, & Catalano, 1997). Although the recent national surveys of adolescent substance use indicate declines in prevalence rates overall, rates for Latino adolescents continue to be high (Delva et al., 2005; Johnston, O'Malley, & Bachman, 2001). For example, data from the 2005 Monitoring the Future survey indicate that Hispanic 8th graders are higher in rates of use of nearly all classes of drugs (except amphetamines) than are 8th grade non-Hispanic Whites or Blacks (Johnston, O'Malley, Bachman, & Schulenberg, 2006) and that Hispanic youth report the highest annual prevalence of heavy episodic drinking (i.e., five or more drinks on one occasion, often referred to

as binge drinking (Johnston et al., 2001). Thus, understanding the factors associated with patterns of substance use among Hispanic adolescents is imperative.

Processes of Cultural Change. One such factor may be the dual cultural adaptation (i.e., acculturation and enculturation) that is required of ethnic minority adolescents living in the U.S. These processes are both multi-axial (e.g., adaptation to the host culture is one axis and adaptation to the ethnic culture is the other axis) and multidimensional in nature (i.e., adaptation includes changes in knowledge, behaviors, attitudes/beliefs, values, and social identities) and result in changes at the level of the individual in a number of psychosocial dimensions (Berry, 2002; Berry, Trimble & Olmedo, 1986; Felix-Ortiz, Newcomb, & Myers, 1994; Gonzales et al., 2002; Knight, Jacobson, Gonzales, Roosa, & Saenz, 2006; LaFramboise, Coleman, & Gerton, 1993; Tsai, Chentsova-Dutton, & Wong, 2002). Moreover, individuals may experience different types of enculturative and acculturative adaptations (Berry, 2006). For instance, individuals may develop and maintain a high degree of association with both the mainstream U.S. culture and the ethnic culture such that they function well in both cultural contexts (i.e., be bicultural). Alternatively, individuals may not adapt well to one or either culture and be limited in the degree to which they function well in either or both cultural contexts (i.e., be assimilated, separated, or marginalized) (Berry, 2006). Further, these adaptations happen over the lifetime of individuals who are newly immigrated, as well as those who have been in the United States for several generations. Therefore, the present investigation examines the relations of trajectories of acculturation and enculturation on several culturally related psychosocial dimensions (e.g., ethnic identity, affiliation/identification preferences, and language use) to heavy episodic drinking and marijuana use in a sample of Mexican American juvenile offenders.

The Role of Enculturation and Acculturation in Substance Use. Various hypotheses have been proposed about the relation of acculturation/enculturation to substance use among Latino minority adolescents, including Mexican Americans. Some authors suggest that higher rates of alcohol and drug use are found among the more acculturated because of the loss of protective factors associated with the culture of origin (e.g., familism, strong sense of interdependence) (Farver, Eppe, & Ballon, 2006; Gil, Wagner, & Vega, 2000; Vega & Gil, 1999). Others suggest that enculturation (e.g., strong social ties to the family, knowledge of and affiliation with and loyalty to one's ethnic group, and strong ethnic identity) (Phinney, 1990) results in lower substance use among ethnic minority adolescents (Gil et al., 2000; Vega, Gil, & Zimmerman, 1993). For example, immigrant Latino adolescents, who one would assume to be more enculturated, used less alcohol than did Latino adolescents born in the U.S. (Gil et al., 2000).

However, findings about the relations of acculturative/enculturative status and Latino adolescent substance use are complex and somewhat mixed. In most cases, indices of higher acculturation have been associated with greater substance use in samples of mixed and non-Mexican American Latino adolescents (Brook, Whiteman, Balka, Win, & Gursen, 1998; Delva et al., 2005; Epstein, Dusenbury, Botvin, & Diaz, 1996; Gil et al., 2000; Marsiglia, Kulis, Hecht, & Sills, 2004; Vega et al., 1993). In contrast, Carvajal, Photiades, Evans, and Nash (1997) found no such association, although their measure of substance use was *intentions to use* substances in the future as opposed to current use. Still others have found that the relation between acculturative status and substance use is more complex than previously understood (Guilamo-Ramos, Jaccard, Johansson, & Turrisi, 2004; Marsiglia et al., 2004). Latino adolescents from Spanish speaking homes reported heavier episodic drinking than Latino adolescents from English speaking homes (Guilamo-Ramos et al., 2004). However, this difference disappeared with greater levels of exposure to the U.S. The longer these Latino adolescents lived in the U.S., the more likely they were to binge drink, regardless of the language spoken in the home.

Similarly to studies of mixed Latino adolescent groups, studies of Mexican American adolescent groups have found higher acculturative status to be associated with higher substance use (Brooks, Stuewig, & LeCroy, 1998; Delva et al., 2005; Felix-Ortiz & Newcomb, 1995; Balcazar, Peterson, & Cobas, 1996; Perez, Padilla, Ramirez, Ramirez, & Rodriguez, 1980). However, with a few notable exceptions (i.e., Felix-Ortiz & Newcomb, 1995; Marsiglia et al., 2004), most of these studies, and those studies of mixed Latino adolescent groups, have had very limited assessments of acculturative/enculturative status, often focusing almost exclusively upon language use and often based upon a uni-axial perspective. In contrast, Felix-Ortiz & Newcomb (1995) measured multiple aspects of cultural identity along both Mexican American and mainstream axes, including assessments of multiple dimensions (cultural familiarity, language proficiency, and traditional family role expectations) and found that the relations between cultural identity and drug use were moderated by the type of drug use, gender, and particular aspects of cultural identity. For example, “bicultural” individuals (i.e., those who were highly adaptive in both cultures) used certain drugs (i.e., alcohol and inhalants) less frequently than did “marginalized” individuals (i.e., those who were less adaptive in both cultures). However, the bicultural individuals used certain drugs more often than did either “Latino-identified” or “American-identified” students. Marsiglia and colleagues (2004) explored the role of ethnicity (ethnic labels), ethnic identity (affiliation, attachment, and pride in one’s ethnic group) and acculturation (English language use) in adolescent/preadolescent drug use and found that the ethnic identity relation to drug use was moderated by ethnicity. Specifically, a strong sense of ethnic identity

was associated with lower drug use for non-Hispanic White participants but higher drug use for Mexican American participants.

The complex findings from the Felix-Ortiz & Newcomb (1995) and Marsiglia et al. (2004) studies demonstrate the importance of assessing psychological dimensions within both acculturation and enculturation axes and are consistent with the possibility that different “types” of acculturative/enculturative adaptations may be differentially associated with substance use. Indeed, we know very little about the relations of different types of enculturation/acculturation strategies to the type, quantity, and frequency of substances used. Nor is there information about the ways in which different dimensions of cultural change processes result in changes over time in substance use among ethnic minority adolescents. That is, if substance use is in part a reaction to differences and difficulties in dual cultural adaptation experiences, then changes over time in cultural orientation should be reflected in changes in substance use over time. Unfortunately, our understanding of the relations of dual cultural adaptation and substance use has been limited because most of the previous studies have not utilized longitudinal designs to directly assess acculturative/enculturative changes and have not taken into account the multi-axial and multidimensional nature of these dual cultural adaptations. The current study extends the research literature by examining the relations of previously identified trajectory classes for several indices of cultural change (Knight et al., in press) to longitudinal growth models in heavy episodic drinking and marijuana use (substances that show the most prevalent use among adolescents) (Chen & Kandel, 1995) in a sample of Mexican American male juvenile offenders who were assessed seven times over a 36-month period. Consistent with our multi-axial/multidimensional model of cultural change, we examine the linkage between a range of psychological dimensions (ethnic identity, language use, and cultural affiliation/identification) to initial levels and changes in substance use in order to better capture the breadth and complexities of these developmental processes.

METHOD

PARTICIPANTS

The present study’s sample consisted of 300 adolescent juvenile offenders who were identified as Mexican-American males recruited from the Phoenix site¹ of an ongoing longitudinal study of desistance from crime (Research on Pathways to Desistance Project [RPD]) (Mulvey et al., 2004). The full sample consisted of 1,354 juvenile offenders who were recruited in Phoenix ($n = 654$) and Philadelphia ($n = 700$). A more detailed report on sample recruitment, study procedures, and sample representativeness for the broader sample is presented elsewhere (Schubert et al., 2004).

Participants were between the ages of 14 and 18 at the time of their initial RPD interview ($M = 16.4$; $SD = 1.07$) and had all been adjudicated delinquent or found guilty of a serious offense (overwhelmingly felonies). Eligible crimes included felony offenses against persons and property, as well as several misdemeanor weapons offenses and sexual assault. Specifically, the juveniles were sentenced for a range of committing offenses: 40.5% for violent crimes against persons (e.g., murder, rape, robbery, assault), 30.4% for property crimes (e.g., arson, burglary, receiving stolen property), 11.2% for weapons crimes, 13.5% for drug-related crimes, 2.4% for sex crimes, and 2% for other crimes (e.g., conspiracy, intimidation of a witness). On average, court records indicate a lifetime history of about two prior petitions to court (not including probation violations). Most of the adolescents were from single-parent homes (67%), and about 42% had parents who completed less than a high school education. Most of the adolescents were born in the U. S. and had parents who were born in the U.S. (61.6%), some were born in the U.S. but had parents who were born in Mexico (22.9%), and some were born in Mexico (15.4%). See Table 1.

PROCEDURE

These adolescents were recruited after a review of court files indicated that they had been adjudicated of a serious offense. Upon obtaining juvenile and parent/guardian informed consent, the adolescents were interviewed within 75 days of their adjudication in the juvenile system (or within 90 days of an adult arraignment if in the Arizona adult system) and then interviewed every six months. Because drug violations represent such a significant proportion of the offenses committed by this age group, and because males account for the vast majority of those cases (Snyder, 2003), the proportion of juvenile males recruited with a history of drug offenses was capped at 15% of the full sample at each site so that the heterogeneity of the sample would not be compromised. The cap did not apply to those adolescents who were processed in the adult criminal system (20% of the Phoenix sample). Data were collected with computer-assisted interviews at the adolescents' homes, in libraries (or other public places), or in facilities. Honest reporting was encouraged, and confidentiality was assured by confidentiality protections provided by statute to the Department of Justice.

Adolescents completed seven assessments over a 36-month period; participants were paid for each assessment with payments ranging from \$50 at the baseline interview to \$115 at the 36-month assessment. The retention rates for this Mexican American sample were very high with 93% to 95% completing assessments every six months over a three-year time period.

TABLE 1
BASELINE CHARACTERISTICS OF THE SAMPLE (N=300) OF MEXICAN AMERICAN
MALE ADOLESCENT OFFENDERS

Characteristic	Mean (SD) or Percentage of Sample
Age (in years):	16.4 (1.07)
Generation status ¹ :	
First	15.4%
Second	22.9%
Beyond second	61.6%
Single-parent home:	67.3%
Parent's education:	
High school or more	58.4%
Less than high school	41.6%
Number of prior petitions to court:	1.94 (2.15)
Official charges:	
Person-related crimes	40.5%
Property crimes	30.4%
Weapons crimes	11.2%
Drug crimes	13.5%
Sex crimes	2.4%
Other crimes	2.0%

¹ First = adolescent and both parents were born in Mexico; Second = adolescent was born in the US and both parents were born in Mexico.

MEASURES

Multigroup Ethnic Identity Measure. At each time point, each individual completed the Multigroup Ethnic Identity Measure (MEIM) (Phinney, 1992) with a response scale that ranges from 1 (strongly disagree) to 4 (strongly agree). The MEIM consists of 12 items assessing two dimensions of ethnic identity development (see Phinney, 2006; Roberts et al., 1999). Exploratory and confirmatory factor analyses of the baseline assessment identified Ethnic Affirmation/Belonging and Ethnic Identity Achievement dimensions. The Ethnic Affirmation/Belonging dimension consists of seven items (i.e., "I am happy that I am a member of the group I belong to"; "I feel strong attachment towards my own ethnic group") assessing ethnic pride or positive feelings towards one's ethnic group, as well as feeling a sense of belonging towards one's ethnic group. The Ethnic Identity Achievement dimension consists of five items (i.e., "I have spent time trying to find out more about my own ethnic group"; "I am active in organizations or social groups that include mostly members of my own ethnic group") assessing an exploration process of one's identity, oriented to

having a secure sense of one's ethnic identity. Average scores were created at each time point for each MEIM dimension.

Acculturation Rating Scale for Mexican Americans-Version II. At each time period each individual completed the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II) (Cuellar, Arnold, & Maldonado, 1995) with a response scale that ranges from 1 (not at all) to 5 (extremely often or almost always). The ARSMA-II consists of 30 items that were originally divided in two axes: 13 items for the American Orientation Scale (AOS) and 17 items for the Mexican Orientation Scale (MOS). Exploratory and confirmatory factor analyses of the initial assessments identified a language and an affiliation dimension (i.e., subscale) within each axis. An English Language dimension consists of eight items (i.e., "I speak English"; "I enjoy listening to English language music"). An Anglo Affiliation/Identification dimension consists of three items (i.e., "I associate with Anglos"; "My friends, while I was growing up, were of Anglo origin"). A Spanish Language dimension consists of nine items (i.e., "I speak Spanish"; "I enjoy listening to Spanish language music"). Finally, a Mexican American Affiliation/Identification dimension consists of three items (i.e., "I associate with Mexicans or Mexican Americans"; "My friends, while I was growing up, were of Mexican origin"). The remaining seven items (e.g., "My family cooks Mexican food"; "My father identifies himself as Mexican"; "My mother identifies herself as Mexicana"; "I identify myself as a Mexican American"; "I identify myself as a Mexican"; "I identify myself as an Anglo American"; "I identify myself as an American") did not load on any dimension and were excluded. Average scores were created at each time point for each axis/dimension.

Defining Trajectory Group Membership for Trajectories of Enculturation and Acculturation. The acculturation and enculturation trajectory groups used as predictors of the trajectories of heavy episodic drinking and marijuana use were obtained from prior research on the Mexican American adolescents in the RPD study (Knight et al., in press). In this earlier research, longitudinal growth curve modeling and growth-mixture modeling procedures using MPLUS (Muthen & Muthen, 2006) verified using SAS Proc Traj (Jones, Nagin, & Roeder, 2001) identified longitudinal trajectory classes for three pairs of enculturation and acculturation variables among this sample of Mexican American adolescents. In these analyses there were seven one-year age-banded outcome periods representing adolescents' reports on six subscales from the MEIM and the ARSMA-II at ages 14 through 20.

Using the Affirmation and Belonging subscale and the Ethnic Identity Achievement subscale of the MEIM, Knight et al. (in press) identified three longitudinal trajectory classes of Mexican American ethnic identification. The first trajectory class represents Mexican American adolescents who initially scored high in Ethnic Affirmation/Belonging and Ethnic Identity Achievement and who were

increasing in both dimensions over time (identified as High and Developing Ethnic Identity). The second class represents Mexican-American adolescents who are initially moderately high but increasing over time in Ethnic Affirmation/Belonging and initially moderate but stable over time in Ethnic Identity Achievement (identified as Moderate Ethnic Identity). The third class represents Mexican American adolescents who were initially low in Ethnic Affirmation/Belonging and Ethnic Identity Achievement and were stable in both dimensions over time (identified as Low Ethnic Identity).

Using the Spanish and English language use subscales from the ARSMA-II, Knight et al. (in press) identified three trajectory classes of Mexican American language use. The first class represents Mexican American adolescents who are high in Spanish and English language use at the 14 to 15 year old age band and are stable over time (identified as Bilingual group). The second group represents Mexican American adolescents who are moderate in Spanish language use and high in English language use at the 14 to 15 year old age band and who are stable over time (identified as Primarily English group). The third group represents Mexican-American adolescents who are low in Spanish language use and high in English language use at the 14 to 15 year old age band and stable in Spanish language use and slightly declining in English language use over time (identified as Monolingual English).

Using the Mexican/Mexican American and Anglo Affiliation/Identification subscales of the ARSMA-II, Knight et al. (in press) identified two trajectory classes. The first group represents Mexican American adolescents who are high in Mexican Affiliation/Identification and moderately low in Anglo Affiliation/Identification at the 14 to 15 year old age band and stable in both dimensions over time (identified as Primarily Mexican). The second group represents Mexican American adolescents who are moderate in Mexican Affiliation/Identification and Anglo Affiliation/Identification at the 14 to 15 year old age band and stable over time (identified as Dual Cultural).

Heavy Episodic Drinking and Marijuana Use. Heavy episodic drinking was assessed by asking respondents to report the number of times in the past six months that they had consumed five or more drinks on the same occasion. Response options (for both the heavy episodic drinking and marijuana use items) ranged from 0 (never), 1 (1 to 2 times), 2 (3 to 5 times), 3 (1 time per month), 4 (2 to 3 times per month), 5 (1 time per week), 6 (2 to 3 times per week), 7 (4 to 5 times per week), and 8 (every day). The definition of heavy episodic drinking (i.e., binge drinking) as five or more drinks at a single occasion (for males) is the most common definition in research studies (White, Kraus, & Swartzwelder, 2006), and it prospectively predicts risk for later alcohol abuse and dependence diagnoses (Chassin, Pitts, & Prost, 2002).

As expected for an offender sample (and in support of the validity of self-reported drinking), the prevalence of heavy episodic drinking among these Mexican American adolescents was higher than reported in national adolescent samples. Fifty-eight percent of the current sample reported some heavy episodic drinking in the past six months at age 15 compared to past month heavy episodic drinking rate of 11.6% of 15 year olds in a 2002-2003 national sample (Substance Abuse and Mental Health Services Administration [SAMHSA], 2003).

Past six month frequency of marijuana use was based on a single item (i.e., “In the past six months, how often have you used marijuana?”) (Chassin, Rogosch, & Barrera, 1991; Sher, 1987). As expected in an offender sample and in support of the validity of our self-reported use, the prevalence of marijuana use in our sample was higher than national data. For example, at age 15, 58% of our sample reported past six-month marijuana use compared to a past month rate of 5.9% among a community sample of 14- to 15-year-old adolescents (SAMHSA, 2003) and a past month rate of 16% among Hispanic 10th graders in the 2005 Monitoring the Future data. Moreover, at the first interview, approximately 41% of the 300 participants met criteria for past 12 month alcohol or drug abuse or dependence diagnoses, which is substantially higher than in typical adolescent samples (i.e., 5% to 21.7% in community samples) (Clark, 2004).

Proportion of Supervised Time (PST). Because many of the participants were differentially housed in supervised environments (such as prison, detention, or residential treatment) for varying periods of time, and their access to substances vary as a function of their exposure to these restricted settings, the current analyses control for the time that these adolescents spent in a supervised environment (Piquero et al., 2001). For the current analyses, the amount of time spent in a controlled environment was transformed into a proportion of the number of days elapsed from one interview to the next interview, resulting in proportion scores ranging from 0 to 1. For example, an adolescent who was placed in a secure placement at wave one for six months would receive a PST score of .50 at wave two (since assessments are conducted about every six months). Across the 36 months of data used for this study, 15% (n=44) of the adolescents were never placed in a supervised setting, and the average time spent in a supervised setting was .42 (*sd* = .33), or 15.1 months.

RESULTS

DATA ANALYTIC PROCEDURE

A sequence of Hierarchical Linear Modeling (HLM) analyses were used to examine the impact of person-level enculturation and acculturation variables on rates of within-person change in adolescents' frequency of heavy episodic drinking and marijuana use between ages 15 and 20² while controlling for the proportion of

supervised time spent in a controlled environment (PST). The hierarchical linear modeling package (HLM) was used for all analyses (Raudenbush, Bryk, Cheong, Congdon, & Du Toit, 2004). Because the outcome data were non-normal and, in the case of heavy episodic drinking, based on episode counts, we used a nonlinear Poisson model with a log-link function (Raudenbush & Bryk, 2002). Preliminary unconditional multilevel analyses showed that between-person variance contributed substantially to overall variance in both heavy episodic drinking (46%) and marijuana use (48%) in terms of the rate of change with age. Using multilevel analyses, variability in outcome measures is represented in a Level 1 model that accounts for within-person variability in age-related changes and PST and a Level 2 model that represents sources of between-person differences associated with the three sets of enculturation/acculturation groups (Affleck, Zautra, Tennen, & Armeli, 1999; Nezlek, 2001). Thus, for example, at Level 1, the log-link function of within-person change in heavy episodic drinking (or marijuana use) was predicted from the grand mean of heavy episodic drinking (or marijuana use) across all age-waves, age, PST, and an interaction of age and PST. The Level 2 model accounted for person level differences associated with ethnic identity groups (or language use groups or affiliation/identification groups) in the overall level of heavy episodic drinking (or marijuana use) at age 15, the age-related change in heavy episodic drinking (or marijuana use), the effect of PST on change in heavy episodic drinking (or marijuana use), and the time varying effect of PST on heavy episodic drinking (or marijuana use).

To examine the observed individual differences in adolescent starting levels and changes over time in heavy episodic drinking and marijuana use, a series of three sets of HLM analyses for each substance use variable were conducted using the Ethnic Identity (Affirmation and Belonging/Ethnic Identity Achievement), Language Use (English and Spanish), and Affiliation/Identification (Anglo and Mexican/Mexican American) trajectory groups as predictors. In these three sets of analyses, each set of trajectory groups were dummy coded in the model and no intercepts were specified at Level 2. The results of these analyses provided estimates of average initial levels at age 15 and rates of change over time in heavy episodic drinking and marijuana use for each set of trajectory groups. Pairwise contrasts were used to examine all pairwise differences between trajectory groups in their initial level and change over time in heavy episodic drinking and marijuana use. In all of these HLM analyses, the impact of PST was controlled. The following is an example of one model for heavy episodic drinking and ethnic identity (EI):

Level 1:

$$\ln(\text{binge}_{ij}) = \nu_{ij} = \pi_0 + \pi_1(\text{Age}_{ij} - 15) + \pi_2(\text{PST}_{ij} - .36) + \pi_3(\text{Age}_{ij} - 15) \times (\text{PST}_{ij} - .36)$$

Level 2:

$$\pi_0 = \beta_{01} \text{HIGH EI} + \beta_{02} \text{MODERATE EI} + \beta_{03} \text{LOW EI} + r_{01}$$

$$\pi_1 = \beta_{11} \text{HIGH EI} + \beta_{12} \text{MODERATE EI} + \beta_{13} \text{LOW EI} + r_{11}$$

$$\pi_2 = \beta_{21} \text{HIGH EI} + \beta_{22} \text{MODERATE EI} + \beta_{23} \text{LOW EI} + r_{21}$$

$$\pi_3 = \beta_{31} \text{HIGH EI} + \beta_{32} \text{MODERATE EI} + \beta_{33} \text{LOW EI} + r_{31}$$

In the Level 1 model equation above, the chronological age is centered at age 15, and the proportion of supervised time is centered at .36. The outcome $\ln(y_{ij})$ represents the frequency of heavy episodic drinking in logarithms, therefore the exponential model $\exp(\mu_{ij})$ represents the expected frequency of heavy episodic drinking in the original units of measurement. In the equation for Level 2, the model includes the three trajectory classes but does not include intercepts. When specific comparisons are made, one of the trajectory groups in the previous Level 2 model is dropped and an intercept term is added.

Presented results are based on the population-average model results with robust standard errors using the Penalized Quasi Likelihood estimation method (Schall, 1991). Using robust standard error estimates ensures a conservative estimate of error in the presence of non-normally distributed data (Raudenbush & Bryk, 2002). Effect estimates are presented in terms of event rate ratios (ERR), which are the beta coefficient exponentiated in a Poisson model. An event rate ratio is interpreted as the percentage change in a dependent variable associated with a 1-unit increase in an independent variable. Variance components of each HLM multi-level model provide estimates of variance explained by each one of the random coefficients from Level 1.

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Table 2 provides the event rate ratios (ERR), multiple comparison tests for the intercepts and slopes, variance components, and goodness-of-fit indices for the acculturation trajectories and for each substance use outcome. Initial HLM analyses controlling for PST in a Level 1 model indicated that levels of both heavy episodic drinking and marijuana use were significantly different from zero at age 15 ($p < .001$) and varied significantly between adolescents ($p < .001$). Heavy episodic

drinking declined significantly (7%) as the adolescents grew older ($ERR = 0.93, p < .05$) and the rate of change in heavy episodic drinking varied significantly between adolescents ($p < .001$). Marijuana use remained stable as adolescents grew older, but varied significantly between adolescents ($p < .001$).

MODERATION OF RATE OF CHANGE IN HEAVY EPISODIC DRINKING AND MARIJUANA USE BY ETHNIC IDENTITY GROUPS, LANGUAGE USE GROUPS, AND AFFILIATION/IDENTIFICATION GROUPS

Figure 1 illustrates the trajectories of the ethnic identity/achievement, language use, and affiliation/identification predicting heavy episodic drinking and marijuana use.

Ethnic Identity Trajectory Class Differences in Heavy Episodic Drinking and Marijuana Use. As illustrated in Figure 1a, the high EI group showed the highest initial frequency of heavy episodic drinking, which corresponded to a frequency of approximately once every two months to once per month in a six month period (after accounting for PST; $ERR = 2.75, p < .001$)³. The Moderate EI group's initial frequency of heavy episodic drinking was not statistically different from the High EI group's initial level. However, compared to the high EI group, the Low EI group reported significantly lower initial frequencies of heavy episodic drinking, and this initial level was not significantly different from zero ($ERR = 0.82, ns$). Although the High EI group started at the highest level of heavy episodic drinking, they also showed the steepest decline with age. The High EI group showed a 24% decline in PST adjusted heavy episodic drinking between 15 and 20 years of age ($ERR = 0.76, p < .001$). By contrast, neither the moderate nor the Low EI groups changed significantly in heavy episodic drinking between 15 and 20 years of age ($ERR = 0.94, p = .10$; $ERR = 1.13, p > .05$, respectively). The pairwise comparisons indicated that the High EI group showed an 18% greater decline in heavy episodic drinking than the Moderate EI group ($ERR = 0.82, p < .05$) and a 32% greater decline in heavy episodic drinking than the Low EI group ($ERR = 0.68, p < .01$).

As illustrated in the lower panel of Figure 1a, the high EI group showed the lowest initial frequency of marijuana use, which was not statistically different from zero ($ERR = 1.03, ns$). Compared to the high EI group, both the moderate and low EI groups reported higher initial frequencies of marijuana use, ($ERR = 2.28, p < .001$ and $ERR = 1.73, p < .10$, respectively). The initial marijuana frequency of use was similar for the moderate and low EI groups and corresponded to a frequency of approximately three times in a six month period to about five times in a six month period. Neither the High EI nor Low EI group changed statistically in marijuana use between 15 and 20 years of age. By contrast, the Moderate EI group showed an 11% decline in PST adjusted marijuana use between 15 and 20 years of age ($ERR = 0.89, p < .05$). The pairwise comparisons indicated that the Moderate EI group

FIGURE 1
AGE-RELATED CHANGES IN HEAVY EPISODIC DRINKING AND MARIJUANA USE AS A FUNCTION OF
TRAJECTORY GROUP MEMBERSHIP FOR ETHNIC IDENTITY, LANGUAGE USE, AND AFFILIATION

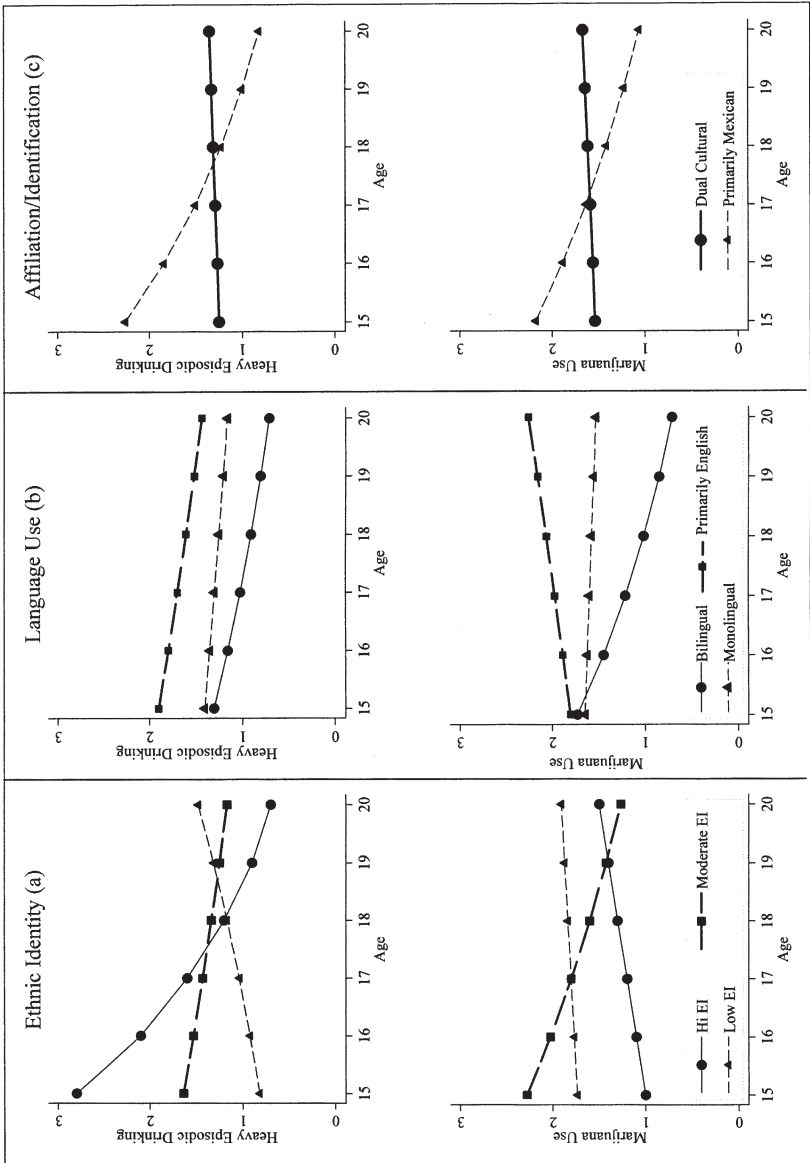


TABLE 2
HIERARCHICAL LINEAR MODELING EVENT RATE RATIO PREDICTING MARIJUANA USE AND HEAVY EPISODIC DRINKING (CONTROLLING FOR PST) FOR ETHNIC IDENTITY, LANGUAGE, AND AFFILIATION/IDENTIFICATION TRAJECTORY GROUPS

	Ethnic Identity			Language Use			Affiliation/Identification		
	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy	Heavy
Fixed effects/ Group ³	Episodic Drinking ²	Marijuana Use ²	Group ³	Episodic Drinking ²	Marijuana Use ²	Group ³	Episodic Drinking ²	Marijuana Use ²	Group ³
Initial Level: High EI (n=70)	2.75**** ^a	1.03 ^b	Bilingual (n=81)	1.31 ^a	1.73** ^a	Primarily Mexican (n=103)	2.26**** ^a	2.18**** ^a	Primarily Mexican (n=103)
Moderate EI (n=178)	1.64**** ^a	2.28**** ^a	Primarily English (n=71)	1.90**** ^a	1.81** ^a	Dual Cultural (n=197)	1.25 ^b	1.54**** ^a	Dual Cultural (n=197)
Low EI (n=52)	0.82 ^b	1.73** ^a	Monolingual (n=148)	1.41** ^a	1.65** ^a				
Rate of Change: High EI	0.76**** ^b	1.09 ^b	Bilingual	0.89** ^a	0.84** ^{b, d}	Primarily Mexican	0.82** ^a	0.87** ^a	Primarily Mexican
Moderate EI	0.94 ^a	0.89** ^a	Primarily English	0.95 ^b	1.05** ^{a, c}	Dual Cultural	1.02 ^b	1.02 ^b	Dual Cultural
Low EI	1.13 ^a	1.02 ^{b, b}	Monolingual	0.96 ^a	0.99 ^{c, d}				
Variance components¹									
Level-2: Initial Level	5.14****	5.59****		4.99****	5.53****		5.09****	5.41****	
Rate of Change Age	8.51****	14.42****		8.17****	14.75****		8.23****	14.85****	
Rate of Change PST	0.29****	0.38****		0.29****	0.39****		0.28****	0.37****	
Rate of Change Age by PST	0.71****	1.18****		0.71****	1.23****		0.72****	1.26****	
Goodness-of-fit									
Deviance	6181.83	7008.00		6289.37	7042.55		6159.16	6939.30	
AIC	6213.83	7040.00		6321.37	7074.55		6183.16	6963.30	
BIC	6362.03	7188.20		6469.57	7222.74		6294.31	7074.45	

¹Variance component at Level-1 is $\pi^2/3=3.2899$. ²Fairwise exploratory comparisons at p-value of .05, coefficients that share superscripts do not significantly differ. ³Numbers in parentheses indicate the sample size for each group. *p < .05. **p < .01. ***p < .001.

showed an 18% greater decline in marijuana use than the High EI group and a 13% marginal decline in marijuana use than the Low EI group ($ERR = 0.87, p = .09$).

Language Use Group Differences in Heavy Episodic Drinking and Marijuana Use. As illustrated in Figure 1b, the bilingual group showed the lowest, PST adjusted initial frequency of heavy episodic drinking, and this initial level is not significantly different from zero ($ERR = 1.31, ns$). Compared to the Bilingual group, the Primarily English group reported significantly higher initial frequencies of heavy episodic drinking ($ERR = 1.90, p = .001$), which corresponded to a frequency of about two to three times in a six month period. The Monolingual English group reported marginally higher initial heavy episodic drinking frequencies than the bilingual group ($ERR = 1.41, p < .10$). Neither the Primarily nor the Monolingual English group changed significantly over time in heavy episodic drinking; however, the Bilingual group showed a marginal 11% decline in PST adjusted heavy episodic drinking between 15 and 20 years of age ($ERR = 0.89, p < .10$).

As illustrated in the lower panel of Figure 1b, the initial level of marijuana use showed no significant pairwise differences among the three language groups but all initial levels were significantly different than zero ($ps < .05$), with frequency levels corresponding to about two to three times in a six month period (after accounting for PST). The Bilingual group showed a 16% decline in PST adjusted marijuana use between 15 and 20 years of age ($ERR = 0.84, p < .05$). By contrast, the Primarily English and Monolingual English speakers did not change significantly in frequency of marijuana use between 15 and 20 years of age ($ERR = 1.05, ns$, and $ERR = 0.99, ns$, respectively). The pairwise contrasts showed that the rate of age-related change was significantly different for the Bilingual and Primarily English groups ($ERR = 1.25, p < .05$).

Affiliation/Identification Group Differences in Heavy Episodic Drinking and Marijuana Use. As illustrated in Figure 1, the Primarily Mexican group showed the highest initial frequency of heavy episodic drinking, which corresponded to a frequency of approximately three to five times in a six-month period, after accounting for PST ($ERR = 2.26, p < .001$). Compared to the Primarily Mexican group, the Dual Cultural group's initial level of frequency of heavy episodic drinking was significantly lower and not statistically different from zero ($ERR = 1.25, ns$). The Primarily Mexican group showed an 18% decline in PST adjusted heavy episodic drinking between 15 and 20 years of age ($ERR = 0.82, p < .05$).

As illustrated in the lower panel of Figure 1c, the Primarily Mexican group showed the highest initial frequency of marijuana use ($ERR = 2.18, p < .001$), which corresponded to a frequency of approximately three to five times in a six month period (after accounting for PST). Compared to the Primarily Mexican group, the Dual Cultural group's initial frequency of marijuana use was significantly lower

and statistically different from zero ($ERR = 1.54, p > .01$). The Primarily Mexican group showed a 13% decline in PST adjusted marijuana use between 15 and 20 years of age ($ERR = 0.87, p < .05$).

DISCUSSION

The current study examined the individual differences in initial levels (at 15 years of age) and trajectories (from 15 to 20 years of age) of heavy episodic drinking and marijuana use (controlling for time spent in an supervised environment) among a sample of Mexican American male juvenile offenders using trajectories of acculturation and enculturation as predictors. To our knowledge, this study is the first of its kind to use multiple indices of cultural change to predict trajectories of heavy episodic drinking and marijuana use. The current study was multi-axial in that it utilized measures of both adaptation to the ethnic culture and adaptation to the mainstream culture. It was multidimensional in that it utilized measures of multiple psychosocial dimensions including ethnic identity, Spanish and English language use, and Mexican/Mexican American and Anglo affiliation/identification preferences. Finally, it was longitudinal, allowing an assessment of how these multi-axial and multidimensional changes in cultural orientation are related to trajectories of heavy episodic drinking and marijuana use.

Much of the past empirical evidence has suggested that becoming acculturated has negative outcomes, including increases in alcohol and other illicit drug use (Balcazar et al., 1996; Brooks et al., 1998; Epstein et al., 1996; Felix-Ortiz & Newcomb, 1995; Gil et al., 2000; Guilamo-Ramos et al., 2004; Marsiglia et al., 2004; Perez et al., 1980; Vega et al., 1993). There has also been some suggestion that becoming bicultural, rather than just being highly connected to the ethnic culture, is likely to be associated with positive mental health and lowered substance use outcomes (Felix-Ortiz & Newcomb, 1995; Gonzales & Kim, 1997). The present findings, although not completely consistent with either of these perspectives, are more consistent with the possibility that biculturalism has positive outcomes. In the current study, the Mexican American adolescents represented by the Dual Cultural group had relatively low initial levels of heavy episodic drinking and marijuana use and did not change from this level over time. Similarly, the Mexican-American adolescents represented by the Bilingual group had relatively low initial levels of heavy episodic drinking and marijuana use, and decreased in both heavy episodic drinking and marijuana use over time.

The pattern of findings regarding the ethnic identity groups is more difficult to interpret with regard to biculturalism. However, these findings are not consistent with the notion that enculturation operates as a protective factor because those Mexican Americans represented in the High Ethnic Identity group started out substantially

higher in alcohol use than the Low Ethnic Identity group. Furthermore, the Mexican-American adolescents represented in the Low Ethnic Identity group are not notably more involved in either heavy episodic drinking or marijuana use than the other ethnic identity groups as one might expect if enculturation were protective. These results are consistent with the findings of Marsiglia et al. (2004), who reported higher drug use for Mexican Americans with a strong sense of ethnic identity at an average age of 13 years.

As indicated earlier, frequent use of Spanish along with the frequent use of English (i.e., linguistic biculturalism) appears to be associated with lower substance use. This finding is not necessarily inconsistent with the existing literature because most of the studies examining the linkage do not include monolingual Spanish speakers (i.e., Balcazar et al., 1996; Brooks et al., 1998; Carvajal et al., 1997; Epstein et al., 1996; Felix-Ortiz & Newcomb, 1995; Gil et al., 2000; Guilamo-Ramos et al., 2004; Marsiglia et al., 2004; Perez et al., 1980). Hence, it is difficult to know from the existing literature whether it is just enculturation, as represented by the use of Spanish language, or biculturalism that is truly protective. Only one study we identified sampled monolingual Spanish speakers and that study did find them to be lower in alcohol use compared to the bilingual and monolingual English speakers. Clearly, a more ideal test of this possibility would require a sample of monolingual Spanish speakers. If we had sampled this group, our analyses might have revealed some trajectory groups with even lower levels of alcohol and marijuana use. However, our participants were required to complete assessments in English.

Although the overall pattern of the results suggest that being “bicultural” (i.e., successfully adapting to the ethnic and mainstream cultures) may well be functional and related to more positive substance use outcomes, these relations may be moderated by elements of the immediate social context within which the adolescent is embedded. For instance, if an adolescent comes from a home and community (broadly defined) with highly traditional Mexican/Mexican American cultural values, where the parents and community members almost exclusively speak Spanish, then being highly enculturated may be functional and lead to positive outcomes. On the other hand, a more acculturated cultural orientation may be more functional if the Mexican-American adolescent lives in a family and community that have become fully enmeshed into the mainstream such that the family and community members almost exclusively speak English and embrace more European-American behaviors, values, and norms. Although examining these types of moderated relations is not possible in the present data because of the sample size and unavailability of appropriate moderator variables, future research should test such “person-environment fit” models of the relations between enculturation and acculturation and adolescent life outcomes, including substance use.

As noted, the present findings are inconsistent with much of the previous research (Brook et al., 1998; Delva et al., 2005; Epstein et al., 1996; Gil et al., 2000; Vega et al., 1993) indicating that high levels of acculturative status are associated with increased risk for substance use and that a more enculturated status is protective. However, the previous studies have typically focused on only one axis of cultural identity, such as acculturation, and/or have assessed only one dimension of cultural orientation, such as language. The findings of the current study may be different because we used longitudinal assessments of several culturally related variables that assessed adaptation to the ethnic and mainstream culture. Hence, this longitudinal, multi-axial, and multidimensional investigation provides evidence to suggest that the relations of enculturation and acculturation to substance use is more complicated than formerly understood.

One question is whether the current findings would generalize to broader samples of Mexican American adolescents, beyond the serious juvenile offenders examined here, many of whom were already heavily substance involved by the time they entered this study. However, there are reasons to believe that these linkages between the changes in enculturative and acculturative status and changes in substance use may be somewhat representative of more normative developmental outcomes. In the previous study with this sample, Knight et al. (in press) found that the age-related changes in the ethnic identity dimensions were similar to the changes in ethnic identity development reported for a community sample of Latino adolescents (French, Seidman, Allen, & Aber, 2006) and are consistent with the theories of ethnic identity development (Marcia, 1980, 1993; Phinney, 1989).

Furthermore, even if the observed longitudinal associations are somewhat unique to a sample of serious juvenile offenders, the overall levels of acculturation and enculturation are inconsistent with the literature that suggests that higher enculturative status is protective and that higher acculturative status is a risk factor for substance abuse. If enculturation is protective, and acculturation is a risk, one would expect that most Mexican American serious juvenile offenders in our sample would score low on indices of enculturation (i.e., ethnic affirmation/belonging, ethnic identity achievement, Spanish language use, and Mexican/Mexican-American affiliation/identification) and high on indices of acculturation (i.e., English language and Anglo affiliation/identification). Yet, this is not the case. For example, only 17% (i.e., 52 adolescents) of our sample was low in ethnic affirmation/belonging and identity achievement.

Although the current study contributes to the literature by providing a longitudinal, multi-axial, and multidimensional test of the relations between acculturation and enculturation and adolescent substance use, it is also important to recognize its limitations. First, our sample likely underrepresented highly enculturated and little

acculturated adolescents. Although 15.4% of our adolescents were born in Mexico, we did not include monolingual Spanish speaking youths. Given that 5.2% of the Mexican-American population speaks Spanish at home and speaks English less than “very well” (U.S. Census Bureau, 2001), probably less than 5% of the Mexican-American population is monolingual Spanish speaking. Hence, we probably did exclude a small proportion of the Mexican-American offender population from participating in this study. A more ideal test of the multi-axial, multidimensional cultural change processes and relations to substance use requires a broader sample that includes highly enculturated but modestly acculturated participants. We were unable to examine to the fullest extent the relation of these dual cultural adaptation processes to substance use because our sample was restricted to Mexican-American adolescents who could complete the interview measures in English. Second, we did not examine the relations of these culturally related variables to substance use among females because of the small number of Mexican-American females in the sample. Third, the trajectory groups identified in this study are intended as an approximation of a more complex underlying reality. Hence, the number of groups and the shape of each group’s trajectory based upon longitudinal data are limited by the number of individuals and the number of observations for each individual. Because the trajectory methodology creates a summary that describes the behavior and characteristics of individuals following similar developmental courses (i.e., it summarizes the average behavioral trend of a collection of individuals), individuals assigned to specific trajectory groups may not follow the overall trajectory pattern perfectly. However, individuals assigned to a particular trajectory resemble one another and the overall trajectory more so than they do another trajectory group. In this sense, they are following about the same developmental course and have distinctive characteristics from other clusters of individuals following different developmental courses (Piquero, 2007; Nagin & Tremblay, 2005). Fourth, all of the measures relied on self-reports where concerns associated with over- and underreporting are always present.

Despite these limitations, we believe the present research provides deeper insights into Mexican- American adolescent substance use and associated enculturative and acculturative processes of change. The current findings provide evidence of the predictability of changes in heavy episodic drinking and marijuana use with age, using trajectories of change in acculturation and enculturation, and they call into question the notion that increased substance use is simply related to greater acculturation. These findings highlight the importance of considering aspects of both acculturation and enculturation processes in understanding trajectories of substance use among Mexican-American adolescents.

NOTES

- ¹ There were only 32 Mexican-American females, and the selection criteria were different for female offenders, hence they were not included in these analyses. Moreover, there was only one Mexican- American participant in the Philadelphia site and that participant was not included in the present sample.
- ² Substance use frequency data from the baseline interview data was not used in this study because no data were available on proportion of time spent in a controlled environment at this assessment.
- ³ Of course, this average is lowered by the inclusion of abstainers.

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