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Applying General Strain Theory to Examine Perceived Discrimination's Indirect Relation to Mexican-Heritage Youth's Alcohol, Cigarette, and Marijuana Use

Jennifer A. Kam,

School of Communication, The Ohio State University, Columbus, OH 43210, USA

Michael J. Cleveland, and

The Methodology Center, The Pennsylvania State University, State College, PA 16801, USA

Michael L. Hecht

Communication Arts & Sciences, The Pennsylvania State University, State College, PA 16802, USA

Jennifer A. Kam: kam.12@osu.edu; Michael J. Cleveland: mjc37@psu.edu; Michael L. Hecht: mhecht@psu.edu

Abstract

Latent growth curve modeling was used to test four hypotheses. First, this study hypothesized that acculturation-related variables (e.g., Mexican-heritage youth's country of origin, time spent in the U.S., and language preference with family and friends) would be associated with initial levels of perceived discrimination. Guided by general strain theory (GST), this study then posed a second hypothesis: Initial levels of perceived discrimination would be indirectly related to initial levels of substance use through initial levels of acculturation stress. Third, this study hypothesized that changes in perceived discrimination would be indirectly related to changes in substance use through changes in acculturation stress. As a fourth hypothesis, it was postulated that initial levels of perceived discrimination would be indirectly related to changes in substance use through changes in acculturation stress. Mexican-heritage youth ($N=1,106$) from 29 schools in Phoenix, AZ completed surveys at six waves from 5th through 8th grades. In partial support of the first hypothesis, more time spent in the U.S. and speaking English with friends were associated with lower levels of perceived discrimination. The second hypothesis was not supported. Initial levels of perceived discrimination were positively associated with initial levels of acculturation stress; however, this association was not found between initial levels of acculturation stress and substance use. The third and fourth hypotheses were supported, which buttressed predictions derived from GST. Both initial levels and increases in perceived discrimination were indirectly related to increases in substance use through increases in acculturation stress.

Keywords

General strain theory; Perceived discrimination; Substance use; Mexican-heritage youth; Latent growth curve modeling

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Correspondence to: Jennifer A. Kam, kam.12@osu.edu.

Jennifer Kam is an assistant professor in the School of Communication at The Ohio State University. Michael Cleveland is a research associate in The Methodology Center at The Pennsylvania State University. Michael Hecht is Distinguished Professor of Communication Arts & Sciences at The Pennsylvania State University

Latinos/as are the largest and one of the fastest growing groups in the U.S., with the Latino/a population projected to nearly double from 15% to 30% by 2050 (U.S. Census Bureau 2008). Further, national survey data revealed that Latinos/as' substance use rates remain relatively high, with 8th grade Latinos/as reporting a higher percentage of use in all types of substances (except amphetamines) than White and Black students (Johnston et al. 2007). The Latino/a population faces culturally-related strains (i.e., stressors) that make them susceptible to substance use. One of these strains, perceived discrimination, is a particularly salient phenomenon (National Survey of Latinos 2002). Perceived discrimination refers to an individual's belief that he/she has been treated unfairly as a result of others' negative attitudes and inflexible stereotypes toward him/her as an outgroup member (Hecht 1998; Romero and Roberts 1998). Discrimination against Latinos/as is not only prevalent but is complex because it may be based on their generation status (Pérez et al. 2008), linguistic qualities (Ajayi 2006), physical features (DeGarmo and Martinez 2006), and often disadvantaged socioeconomic status (Araújo and Borrell 2006). In 2002, 83% of Latinos/as reported experiencing discrimination (National Survey of Latinos 2002), which is associated with a number of negative outcomes, including substance use, school dropout, and poor academic performance (Gibbons et al. 2007).

Despite these consequences, this area of research remains underdeveloped, particularly among Latinos/as (Araújo and Borrell 2006). As a result, this study focuses on perceived discrimination among Mexican-heritage youth, following them from 5th through 8th grades. Individuals of Mexican descent were chosen because Mexican-heritage youth comprise the largest percentage of children from immigrant families within the U.S. (Cavanagh 2007) and report some of the highest levels of discrimination (Gee et al. 2006). General strain theory (GST; Agnew 2001) was used as a framework to investigate perceived discrimination's indirect relation to substance use behaviors. First, this study proposed that Mexican-heritage youths' country of origin, time spent in the U.S., and language preference with family and friends are associated with initial levels of perceived discrimination. In turn, this study applies tenets of GST to argue that changes in and initial levels of perceived discrimination are indirectly related to changes in and initial levels of alcohol, tobacco, and other drug (also commonly known as ATOD) use through changes in and initial levels of acculturation stress. This study extends GST's traditional consideration of negative affect in the forms of anger, frustration, and depression as intervening variables between strain and delinquency by considering acculturation stress, located within a cultural context, as a potential intervening variable. Consequently, this study's findings have both theoretical and practical implications for prevention research.

Acculturation-Related Variables Associated with Perceived Discrimination

Levels of perceived discrimination likely depend on Mexican-heritage youths' acculturation or the process that occurs when individuals adopt certain cultural elements of another group through contact with members of that group (Pérez et al. 2008). Predictors of acculturation in later adolescence often include place of birth, time in the U.S., and preference for English or Spanish when speaking with family and friends (López 2009; Samaniego and Gonzales 1999). Several explanations describe the ways in which these factors may be associated with perceived discrimination and its indirect relation to ATOD use.

The first perspective proposes that perceived discrimination among Latinos/as, and more specifically, among Mexican-heritage youth, may emerge because of limited linguistic skills and familiarity with mainstream U.S. culture (Ajayi 2006; Araújo and Borrell 2006; Moradi and Risco 2006). Mexican-heritage youth who were born outside the U.S. or who have spent less time in the U.S. may have poorer English skills and less knowledge of mainstream culture, thereby experiencing higher levels of perceived discrimination. Further, less

acculturated adolescents often have stronger ties to their native culture and ethnic identity; thus, they may be more likely to recognize discrimination (Romero and Roberts 1998). In turn, these youth may experience more acculturation stress, which ultimately places them at risk of ATOD use.

The second perspective, however, suggests that youth who were born in the U.S., who lived in the U.S. for a longer period of time, and who prefer speaking English with family and friends are not only more acculturated but may become aware of the ethnic disparities and hierarchies within the U.S., thereby perceiving greater discrimination (Guilamo-Ramos et al. 2004; Samaniego and Gonzales 1999). Youth who have spent more time in the U.S. also have increased opportunities to experience discrimination, as they have more interactions with individuals from the mainstream culture, resulting in greater acculturation stress and problem behaviors (e.g., ATOD use; Agnew 2001; Guilamo-Ramos et al. 2004; Vega et al. 1995).

In short, both rationales suggest that acculturation predicts perceived discrimination; however, each rationale offers a different explanation for the specific way in which acculturation is related to discrimination. The first posits that acculturation predicts discrimination, but less acculturated youth experience more discrimination. The second rationale posits that acculturation predicts discrimination, but the more youth are acculturated, the more they experience discrimination. Based on these two perspectives, it can be hypothesized that acculturation-related variables are associated with perceived discrimination. Yet, the ways in which they are associated with perceived discrimination remain unestablished. Hence, the following hypothesis was developed:

H1: Acculturation-related variables such as Mexican-heritage youth's country of origin, time spent in the U.S., and language preference with family and friends are associated with initial levels of perceived discrimination.

Elucidating Perceived Discrimination Using General Strain Theory

Past research (Araújo and Borrell 2006; Edwards and Romero 2008) provides evidence of a positive association between perceived discrimination and poor mental health among Latinos/as. More recently, Delgado et al. (2009) found a positive association between perceived discrimination and risky behaviors among Mexican-heritage adolescents. Nevertheless, research regarding perceived discrimination's relation to these youths' substance use behaviors remains underdeveloped and often lacks a theoretical framework (Araújo and Borrell 2006; Delgado et al. 2009). Theoretically explaining these associations contributes not only to an improved understanding of the etiology of Latino/a substance use but also may open promising areas for prevention research and practice.

GST (Agnew 2001) provides an explanation for the connection between perceived discrimination and problem behaviors (e.g., ATOD use). According to the theory, strains occur when individuals are subjected to situations or experiences that they dislike (Agnew 2001), which induces negative psychological and affective reactions (Brezina 1996). Individuals may find numerous ways to cope with their negative psychological and affective responses, but GST focuses on strains that increase the likelihood that individuals, particularly those with limited personal and social resources (Aseltine et al. 2000; Brezina 1996), will use unhealthy behaviors as coping strategies (Agnew et al. 2002; Agnew and White 1992).

Strains do not necessarily result in problem behaviors (Kaufman et al. 2008); however, Agnew (2001) suggested that oppressive strains such as perceived discrimination may place individuals at greater risk for engaging in problem behaviors. General strain theorists

identify three prominent sources of strain: “the failure to achieve positively valued goals, the loss of positively valued stimuli, and the presentation of negative stimuli” (Broidy and Agnew 1997, p. 277). Perceived discrimination fits this conceptualization when individuals encounter unfair treatment based on their ethnic group membership—an experience that exemplifies: (1) being exposed to a negative stimulus, (2) having their sense of security removed, and (3) being prevented from fulfilling the goal of receiving equal treatment (Ajayi 2006). Perceived discrimination fits the pattern of strain that is likely to induce negative affect, thereby motivating problem behaviors as a coping strategy (Agnew 2001; Agnew and White 1992). Substance use may be one way to escape from the negative affect when being discriminated against (Eitle and Turner 2003).

Among Latinos/as, past studies revealed that perceived discrimination was positively associated with psychological distress and risky behaviors, as well as negatively associated with psychological and academic well-being (DeGarmo and Martinez 2006; Delgado et al. 2009). To date, however, few studies have considered the associations between oppressive types of strains such as discrimination and GST among ethnic minorities (Pérez et al. 2008; Preston 2006). Even fewer studies have specifically addressed perceived discrimination’s relation to ATOD use among Mexican-heritage youth or acculturation stress as an intervening variable that may account for this association.

Perceived Discrimination’s Indirect Associations through Acculturation Stress

In addition to positing a link between perceived discrimination and ATOD use, GST provides the basis for understanding how this link operates. Agnew et al. (2002) stated that negative emotions function as partial intervening variables between strains and delinquent behavior. Past research (e.g., Broidy 2001) on GST investigated anger, anxiety, frustration, and depression as intervening variables. Pérez et al. (2008) documented anger as a mediator between perceived discrimination and violent behavior among Hispanic adolescents in low-populated Hispanic schools. With respect to substance use, however, Aseltine et al. (2000) found among high school students reporting on life stressors that anger only predicted aggressive behaviors but not delinquency or marijuana use, while anxiety did not predict any of the three variables. These traditional negative emotional responses (e.g., anger, frustration, depression) to strains are only several of other possible intervening variables. In the context of ethnic/racial discrimination, an experience related to the acculturation process, this study examines how strain is associated with acculturation stress and whether this type of stress is, in turn, associated with substance use.

Acculturation stress, which is highly correlated with negative affect such as anger, anxiety, and depression, is defined as a distinct, complex, and negative psychosocial acculturative process that involves reactions to challenges and troubles that often stem from tension between one’s native culture and the mainstream culture (Leidy et al. 2009; McGinley et al. 2010). In particular, acculturation stress manifests from the acculturation process but also may result from various strains such as perceived discrimination (Finch and Vega 2003; Leidy et al. 2009; McGinley et al. 2010). As youth experience unfair treatment from others through perceived discrimination, they are more likely to develop negative reactions in the form of acculturation stress (Pérez et al. 2008). To alleviate their acculturation stress, Mexican-heritage youth may turn to substance use (Berry 1998). Hence, this hypothesis was set forth:

H2: Initial levels of perceived discrimination are indirectly related to initial levels of ATOD use through initial levels of acculturation stress.

A Growth Modeling Approach to Studying Perceived Discrimination

The tenets of GST and past studies point to a process model, where perceived discrimination is positively related to acculturation stress, which in turn, is positively related to problem behaviors in the form of ATOD use. Unfortunately, while evidence points to these links, most of the discrimination and GST research thus far relies on cross-sectional data (cf. Gibbons et al. 2007) rather than a longitudinal perspective identifying how this process changes across time. Examining change over time is particularly important during adolescence when youth experience substantial “biological, physical, cognitive, and socioemotional” changes (Greenbaum and Dedrick 2007, p. 21). Stipek et al. (1999) suggested that during late-preadolescence, youth become fascinated by and occasionally engage in risky behaviors. Although many youth do not partake in risky behaviors such as substance use, for those who do, early experimentation is a predictor of later problem behaviors, and youth who experience severe stress and adversity are at even greater risk for these negative outcomes (Compas et al. 1995).

Further, Mexican-heritage youth are likely to experience cultural and developmental changes that reflect acculturation and ethnic identity processes. First, if over time, Mexican-heritage youth adopt certain values, norms, and beliefs that reflect U.S. mainstream culture, such cultural changes are likely to influence perceptions of discrimination, acculturation stress, and ATOD use (Pérez et al. 2008). Second, Romero and Roberts (1998) found that older adolescents reported higher levels of perceived discrimination than younger adolescents, which may reflect changes in evaluations and reactions to discrimination as youth grow older and establish a stronger ethnic identity. During late adolescence, many youth engage in ethnic identity exploration, examining the meaning of their ethnicity and the extent to which they value their own ethnic group (Phinney 1992). This process can result in an increased awareness of ethnic disparities, thereby leading to a heightened recognition of discrimination.

This study tests the proposed model with latent growth curve modeling to investigate how changes in perceived discrimination are indirectly related to changes in ATOD use through changes in acculturation stress. Mexican-heritage youth may experience perceived discrimination at different rates and to varying degrees (Araújo and Borrell 2006). Also, their perceptions of discrimination may become more salient as they adopt more elements of U.S. mainstream culture or as they develop a stronger ethnic identity during later adolescence (López 2009), all of which are related to their acculturation stress and their ATOD use. Hence, this hypothesis was posited:

H3: Changes in perceived discrimination are indirectly related to changes in ATOD use through changes in acculturation stress.

Initial Levels of Perceived Discrimination Related to Changes over Time

Although changes are important, Eitle and Turner (2003) also argued that strains, particularly traumatic ones, may exert effects over years after their initial occurrence. Across the substance use prevention literature (e.g., Compas et al. 1995), early experimentation of substance use is often a predictor of later use. Consequently, this study posits that early experiences with perceived discrimination are likely to be related to changes in acculturation stress, and in turn, ATOD use over time. Stated differently, initial perceptions of discrimination are likely to influence how these youth experience acculturation stress and engage in ATOD use at later time points. Thus, it was hypothesized that:

H4: Initial levels of perceived discrimination are indirectly related to changes in ATOD use through changes in acculturation stress.

Method

Participants

Analyses are based on six waves of self-report, longitudinal data provided by 1,106 Mexican-heritage youth from 5th through 8th grades. These youth attended 1 of the 29 Phoenix, AZ public schools that participated in the study. At baseline (i.e., Wave 1; 5th grade), the sample included 2,035 students, 1,837 at Wave 2 (4 to 7 months after Wave 1), 1,478 at Wave 3 (14 to 18 months after Wave 1), 906 at Wave 4 (24 months after Wave 1), 841 at Wave 5 (28 months after Wave 1), and 891 at Wave 6 (37 to 40 months after Wave 1). The attrition rate was as follows: Wave 1 to Wave 2 (10% dropped out), Wave 2 to Wave 3 (19% dropped out), Wave 3 to Wave 4 (39% dropped out), Wave 4 to Wave 5 (7% dropped out), and Wave 5 to Wave 6 (6% increase). Among the overall sample ($N=2,035$) at Wave 1, 547 youth self-identified as Mexican and 1,023 as Mexican American. This study uses the term “Mexican-heritage youth” to describe this subsample.

Because *Mplus* 5.1 (Muthén and Muthén 2007) only uses cases with no missingness on the independent variables, 464 Mexican-heritage youth who had missingness on any of the predictor variables including covariates (e.g., country of origin, time spent in the U.S., language preference with family, language preference with friends, sex, religiosity, and participating in a reduced lunch program) were excluded from this study, thereby resulting in a total number of 1,106 Mexican-heritage youth for this study’s analyses. Students’ average age was 10.4 years ($SD = .61$) at Wave 1 and the sample consisted of 50% males and 50% females. Of the Mexican-heritage youth at Wave 1, 73% were born in the U.S. and 27% in Mexico. In contrast, 69% of these youths’ mothers were born in Mexico, 25% in the U.S., and 6% in another country or unknown. Similarly, 71% of the youth’s fathers were born in Mexico, 20% were in the U.S., and 9% in another country or unknown.

Procedure

Informed consent was obtained from parents and informed assent was obtained from students prior to students completing a 45-minute questionnaire in the presence of trained proctors in homeroom, science, or health classes. A Spanish version was developed using a back-translation method (Rogler 1989), but only 9% of the youth chose this version.

Measures

Mexican-heritage youths’ country of origin, time spent in the U.S., and language preference with family and friends were measured at Wave 1. Perceived discrimination was measured at Waves 1, 4, 5, and 6. Acculturation stress and last-30-days ATOD use were measured at Waves 1–6. See Table 1 for summary statistics and scale reliabilities.

Country of Origin—One item, “Where were you born?” was used to assess youths’ country of origin (Cuéllar et al. 1995), and the response scale was 1=United States and 2=Mexico.

Time Spent in the U.S.—One item was used to measure how much time youth had spent in the U.S. (Cuéllar et al. 1995). The item asked “How long have you lived in the United States?” and was responded to on a 5-point scale (1=less than 1 year, 2=between 1 and 5 years, 3=between 6 and 10 years, 4=more than 10 years, 5=all my life).

Language Preference—Language preference while talking to family and friends was measured with two items from Marin et al.’s (1987) Short Acculturation Scale for Hispanics. Items included, “When talking with family members, what language do you usually speak?” and “When talking with friends, what language do you usually speak?” These items were

responded to on a 5-point scale (1=Spanish only, 3=both English and Spanish, 5= English only).

Perceived Discrimination—Five items were used based on Romero and Roberts (2003). Responses were on a 4-point scale (1=strongly disagree to 4=strongly agree), where higher scores represented greater perceived discrimination. Students were asked, “Thinking about your ethnic group (race or culture), do you agree or disagree with the following?” Sample items included: “People don’t like me because of my ethnic group” or “Kids my age exclude me from their activities or games because my ethnic group is different.” Five composite indices were constructed by averaging the five discrimination (i.e., strain) items at each wave.

Acculturation Stress—Five modified items were adapted from previously established scales: Gil et al. (1994), Mena et al. (1987), Romero and Roberts (2003), and Vinokurov et al. (2002). Students indicated the degree to which (1=not a problem to 3=big problem) five situations (e.g., “I don’t feel at home here in the United States” or “I am embarrassed by the way I speak English”) a problem. To ensure that acculturation stress was distinct from perceived discrimination, inter-item correlations were examined, correlating the five perceived discrimination items with themselves, along with the five acculturation stress items for Waves 1, 4, 5, and 6. In each wave, the five perceived discrimination items had substantially higher correlations with each other and low correlations with the five acculturation stress items, providing support for the distinction between discrimination and acculturation stress.

In addition to inter-item correlations, a series of confirmatory factor analyses (CFAs) were examined in *Mplus* 5.1 for each wave that perceived discrimination was measured. First, a series of two-factor CFAs were performed for each wave with the perceived discrimination and acculturation stress items loaded onto their corresponding factors. At each wave, the two-factor CFA fit the data well: Comparative Fit Index (CFI) ranged from .95 to .98, the Root Mean Square Error of Approximation (RMSEA) ranged from .02 to .03, and the Standardized Root Mean Square Residual (SRMR) was .03 at all four waves. Next, a series of one-factor CFA models were examined for each wave that perceived discrimination was measured. Based on the model fit statistics, the one-factor CFA models did not fit the data well (CFI ranged from .64 to .79, the RMSEA ranged from .08 to .09, and the SRMR ranged from .09 to .13). Each χ^2 difference test comparing the two-factor and one-factor models revealed that the two-factor model significantly improved the model fit at all four waves (Waves 1, 4, 5, and 6). Perceived discrimination appeared distinct from acculturation stress across each wave; therefore, six composite indices were created by averaging the five acculturation stress items for each wave.

Last-30-days ATOD Use—Three items from Graham et al. (1984) were used to measure the amount and frequency of using alcohol, cigarettes, and marijuana within the last 30 days. A 7-point scale was used to measure use of alcohol (1=none to 7=more than 30), cigarette (1=none to 7=more than 20), and marijuana (1=none to 7=more than 40 hits). Sample items included “How many drinks of alcohol have you had in the last 30 days?” or “How many cigarettes have you smoked in the last 30 days?” Six composite indices were constructed for last-30-days ATOD use by calculating the average of the three items at each wave.

Analyses Summary

The data from this study were taken from a larger project evaluating the effectiveness of a school-based substance use prevention program, which was funded by the National Institute on Drug Abuse (NIDA). Because Mexican-heritage youth in this study came from both the

experimental and control schools, a dummy coded variable (control=0; conditions=1) was created to control for program effects. Paths were estimated from this dummy coded variable to the latent factors within each model. Although evaluation of the prevention program was beyond this study's objective, significant program effects were not found in the current study.

In addition to taking into account program effects, sex and religiosity (i.e., how important religion is to the student) were included in the multivariate latent growth curve models (LGM) as covariates because they were significantly related to acculturation stress and ATOD use. The Mexican-heritage youth in this study also attended 1 of the 29 participating schools; thus, the data were observed at distinct hierarchical levels (i.e., multilevel data). Such data may violate the usual assumption of independence among the study variables and may lead to biased estimates. Intraclass correlations (ICC) were calculated for each study variable. All but three were less than .02 and all were less than .06. Multilevel LGM analyses were not conducted because of inadequate sample size at the group level ($N=29$ schools) and relatively low ICC values (Hox and Maas 2001). The TYPE=COMPLEX feature, however, was used in *Mplus* to account for the multilevel-structured data in all of the CFA models, univariate LGMs, and multivariate LGM.

To handle the data's non-normality, the maximum likelihood estimator with robust standard errors (MLR) was used (Muthén and Muthén 2007). The multivariate LGM using MLR was compared to the same model with the indicator variables specified as censored from below. The results and conclusions remained the same. *Mplus*' censoring option employs an algorithm integration method, which only provides the loglikelihood, the Akaike information criteria, and Bayesian information criterion. Because the censoring option yielded the same results as using the MLR estimator and provided limited goodness of fit statistics, this study used the MLR estimator to handle the data's non-normality when examining all the models.

This study's analyses were not limited to youth who participated in all six waves; therefore, the missingness across waves had to be taken into account. Graham (2009) argued that multiple imputation and maximum likelihood methods are better than listwise deletion because the latter often results in a substantial loss of power and can produce biased parameter estimates. Full information maximum likelihood (FIML) is completed in a single analysis using students' raw data and incomplete cases to calculate the parameter estimates and the observed information matrix to calculate the standard errors. Because the attrition rate across the six waves was substantial, comparisons were still made between the results based on listwise deletion and FIML. When considering the CFA results using listwise deletion compared to FIML, the conclusions were the same. Across the waves, the listwise deletion two-factor CFAs for perceived discrimination and acculturation stress fit the data well (CFIs ranged from .95 to .98; RMSEAs ranged from .03 to .05). The univariate LGM for ATOD use yielded similar results for listwise deletion (CFI=.88; RMSEA=.05, 90% CI=.02, .08; SRMR=.10) and FIML, but the univariate listwise LGMs for perceived discrimination (CFI=.97; RMSEA=.04, 90% CI=.00, .08; SRMR=.04) and acculturation stress (CFI=.88; RMSEA=.05, 90% CI=.02, .08; SRMR=.07), along with the multivariate listwise LGM (CFI=.73; RMSEA=.06, 90% CI=.05, .07; SRMR=.08) produced different results and conclusions. With substantial missingness, FIML provided similar results to listwise deletion when considering CFAs and one univariate LGM. Yet, the results differed when faced with more complex models, which is not surprising given the restricted sample considered with listwise deletion. The complexity of this study's models and data, with six waves and several covariates, warranted FIML as a missingness strategy.

Results

To test the proposed hypotheses, univariate LGMs were initially conducted with perceived discrimination, acculturation stress, and last-30-days ATOD use to determine the best-fitting form of change in each outcome. Next, the univariate models' intercepts and slopes were included in a multivariate LGM.

Univariate LGMs

With LGM, researchers investigate the rate of change within individuals and between individuals (Hecht et al. 2006). To test the hypotheses, the variables were measured at four to six time points, with the intercept fixed at 1.0 (i.e., the intercept was constant for all individuals over the waves; Duncan and Duncan 1995). The slope represented Mexican-heritage youths' trajectory based on the repeated measures of the observed variables. All univariate models were examined with fixed slope loadings to represent linear growth and then compared to corresponding models with freed slope loadings to represent non-linear growth. The χ^2 difference tests revealed that the fixed models fit the data significantly better than the freed models; therefore, the following sections describe the results for the fixed models.

A univariate LGM with perceived discrimination was conducted to determine how Mexican-heritage youths' perceived discrimination changed over the study period. The univariate LGM for perceived discrimination had its slope's factor loadings set to 0, 3, 4, and 5 to reflect the unequal intervals between measurements for perceived discrimination. This model fit the data well ($\chi^2 [7]=12.14, p=.10$; CFI=.97; RMSEA=0.03, 90% CI=.00, .05; SRMR=.04). The mean intercept ($M_i=1.62, z=53.97$) and mean slope ($M_s=-.03, z=-3.08$) were significant. The intercept ($Variance_i=.10, z=2.04$) and the slope variance ($Variance_s=.01, z=2.36$) were significant, indicating that individual differences existed for these youths' initial levels and trajectories of perceived discrimination. The association between the intercept and slope for perceived discrimination was not significant ($-.35, z=-1.07$), revealing that initial scores were not associated with perceived discrimination trajectories.

A univariate LGM for acculturation stress was examined and the model fit the data acceptably ($\chi^2 [20]=46.73, p<.05$; CFI=.90; RMSEA=.04, 90% CI=.02, .05; SRMR=.05). The mean intercept was significant ($M_i=1.21, z=67.26$). As a whole, Mexican-heritage youth did not experience a significant change in acculturation stress over the six waves ($M_s=-.01, z=-1.20$). The variance terms, however, for each of the growth parameters indicated that significant individual differences existed in the youths' initial status and trajectories of acculturation stress ($Variance_i=.04, z=6.44, Variance_s=.01, z=2.56$). The relation between strain's intercept and slope was negative and significant ($-.44, z=-3.25$); youth with higher levels of initial acculturation stress experienced slower rates of change over time.

The final univariate LGM was conducted for ATOD use, which fit the data well ($\chi^2 [20]=33.82, p<.05$; CFI=.94; RMSEA=.03, 90% CI=.01, .04; SRMR=.06). The intercept mean was significant ($M_i=1.11, z=40.36$). The significant slope mean ($M_s=.07, z=5.15$) showed that, on average, the Mexican-heritage youth experienced increases in ATOD use over time. The intercept and slope variances ($Variance_i=.09, z=2.65; Variance_s=.02, z=5.68$) also were significant, revealing individual differences in these youths' initial status and trajectories of ATOD use. The association between the intercept and slope was negative but not significant ($-.03, z=-.141$), revealing that initial scores were not associated with ATOD use trajectories.

Examining perceived discrimination, acculturation stress, and ATOD use as univariate LGMs allowed for determining the best-fitting form of changes over time in these

phenomena among Mexican-heritage youth. The results also showed the existence of individual variations in the youths' initial scores and their trajectories for perceived discrimination, acculturation stress, and ATOD use. Consequently, all three univariate LGMs were included together in a multivariate LGM (see Fig. 1).

Multivariate LGM

The four hypotheses were tested in a multivariate LGM with fixed slope loadings, while controlling for program effects, sex, and religiosity. The model fit the data acceptably ($\chi^2 [215]=381.35, p<.05$; CFI=.87; RMSEA=.03, 90% CI=.02,.03; SRMR=.05). The following reports the standardized results. For the first hypothesis, time spent in the U.S. ($\beta=-.37, SE=.06, z=-6.18, p<.05$) and language preference with friends ($\beta=-.12, SE=.05, z=-2.40, p<.05$) significantly predicted initial levels of perceived discrimination. To test for indirect effects, PRODCLIN was used because *Mplus* does not allow for obtaining indirect effects when using TYPE = COMPLEX (to account for the multilevel-structured data). PRODCLIN handles the non-normality in the product of coefficients' distribution and computes asymmetric confidence intervals (CI; Research in Prevention Laboratory 2006). Based on PRODCLIN, time spent in the U.S. was significantly indirectly related to the initial levels (95% asymmetric CI=-.42, -.20) and slope (95% asymmetric CI=.02, .29) of acculturation stress through the perceived discrimination intercept. Language preference with friends was significantly indirectly related to the intercept (95% asymmetric CI=-.18, -.02) and slope of acculturation stress (95% asymmetric CI=.01, .11) through the intercept of perceived discrimination. In contrast, country of origin ($\beta=.01, SE=.06, z=.17, ns$) and language preference with family ($\beta=-.01, SE=.05, z=-.20, ns$) were not significantly related to initial levels of perceived discrimination. The first hypothesis was partially supported.

For the second hypothesis, the intercept of perceived discrimination was positively associated with the acculturation stress intercept ($\beta=.83, SE=.07, z=11.86, p<.05$); however, the acculturation stress intercept was not significantly associated with the intercept of last-30-days ATOD use ($\beta=.05, SE=.05, z=1.00, ns$). The intercept of perceived discrimination was not significantly indirectly related to the intercept of ATOD use (95% asymmetric CI=-.04,.12) through the intercept of acculturation stress. Thus, the second hypothesis was not supported.

With respect to the third hypothesis, the slope of perceived discrimination was positively associated with the slope of acculturation stress ($\beta=.70, SE=.15, z=4.67, p<.05$) and the slope of acculturation stress was positively associated with the slope of ATOD use ($\beta=.29, SE=.13, z=2.23, p<.05$). The perceived discrimination slope was significantly indirectly related to the slope of ATOD use (95% asymmetric CI=.03,.43). The third hypothesis was supported.

When investigating the fourth hypothesis, initial levels of perceived discrimination were negatively associated with the slope of acculturation stress ($\beta=-.40, SE=.18, z=-2.22, p<.05$), which was positively associated with the slope of ATOD use. The intercept of perceived discrimination was significantly indirectly related to the slope of ATOD use (95% asymmetric CI=-.59, -.04) through the slope of acculturation stress. The fourth hypothesis was supported.

The multivariate LGM model explained 69% of the variance in the acculturation stress intercept, 77% of the acculturation stress slope, 4% of the ATOD use intercept, and 8% of the ATOD use slope. These values correspond to small effects for ATOD use intercepts and slopes. For the acculturation stress growth parameters, however, these values correspond to large effect size (Cohen 1988).

Discussion

This study extended previous findings on perceived discrimination among Mexican-heritage youth by applying GST to investigate whether acculturation-related variables were associated with initial levels of perceived discrimination and by examining the role of acculturation stress in these processes. Findings showed that time spent in the U. S. and language preference with friends were significantly related to perceived discrimination, but country of origin and language preference with family were not. Hypotheses derived from GST provided a possible explanation for perceived discrimination's harmful associations. Changes in perceived discrimination placed victims at risk for substance use through acculturation stress. Similarly, initial levels of perceived discrimination were related to increases in ATOD use through increases in acculturation stress. The implications for the findings are explored below.

H1: Acculturation-Related Variables in Association with Perceived Discrimination

Tests of the first hypothesis revealed that time spent in the U.S. and language preference with friends were significantly associated with initial levels of perceived discrimination. Contrary to the suppositions of Guilamo-Ramos et al. (2004) and Samaniego and Gonzales (1999), as Mexican-heritage youth spent more time in the U.S. and as they preferred to speak English with friends, they were less likely to experience perceived discrimination. Although Guilamo-Ramos et al. (2004) may be correct that greater exposure to individuals of the mainstream culture increases opportunities for discrimination, merely spending time in the U.S. does not guarantee that youth will experience discrimination, particularly in communities that are Mexican majority, such as those in the present sample. Conversely, as indicated by the negative association between communicating with friends in English and perceived discrimination, youth who spend more time in the U.S. may improve their linguistic skills and knowledge of mainstream culture, thereby decreasing the rate in which these youth experience discrimination.

On the other hand, language preference with family and country of origin were not significantly associated with initial levels of perceived discrimination. A possible explanation for the non-significant finding for language preference with family may be based on the context for discrimination. Language preference with family often occurs in a private, home setting (Guilamo-Ramos et al. 2004) where individuals from the mainstream culture are not present, thereby decreasing the chances of exposure to discrimination. Country of origin may be more weakly related than time spent in the U.S. In border communities, like Phoenix, people often travel back and forth, muting the effects of their origins. Instead, time spent in the U.S. may better reflect Mexican-heritage youths' developmental changes in perceptions of discrimination, and in turn, acculturation stress and ATOD use. As Romero and Roberts (1998) proposed, youth often explore their ethnic identity in later adolescence, becoming more aware of ethnic disparities in the U.S. at that point. Time spent in the U.S. may represent this developmental process of ethnic identity exploration, making youth more responsive to discrimination.

H2–H4: Testing Perceived Discrimination's Indirect Relations to ATOD Use

The second hypothesis was not supported. Although initial levels of perceived discrimination were significantly associated with initial levels of acculturation stress (accounting for program effects, sex, religiosity, and the multilevel-structured data), initial levels of acculturation stress were not significantly associated with initial levels of ATOD use. This finding is likely based on the age ($M=10.4$ years) of the Mexican-heritage youth at Wave 1, along with their low mean reports of ATOD use at that time ($M=1.13$). Across waves, however, their mean levels of ATOD use increased, which led to a significant association between the slopes of acculturation stress and ATOD use. Perceived

discrimination was not indirectly related to ATOD use among Mexican-heritage youth in 5th grade (Wave 1); however, the relation became significant over time as these youth grew older and reported more substance use.

The third hypothesis was supported. Increases in perceived discrimination exhibited an indirect relation to increases in ATOD use through increases in acculturation stress. These findings lend support for GST by providing evidence of perceived discrimination's direct and indirect associations with Mexican-heritage youths' mental health (e.g., acculturation stress) and health behaviors (e.g., ATOD use). The results are consistent with Moradi and Risco (2006), who found that minority populations, in general, reported greater psychological distress as they experienced perceived discrimination. This study, however, extends past work on perceived discrimination's associations with the behavioral and mental health of Mexican-heritage youth by demonstrating that they experience negative psychological/ affective reactions related to perceived discrimination and are in turn more likely to engage in ATOD use because of these experiences. Acculturation stress is not necessarily a risk factor. There are times and situations when stress is a normal experience from which youth may benefit. Nevertheless, acculturation stress is highly associated with negative affect such as anxiety, anger, and depression, and the way in which youth cope with such stress such as using substance use may be problematic. These findings emphasize the importance of addressing discrimination and sheds light on a possible culturally-grounded explanation of recent national survey data (Johnston et al. 2007) that found Latino/ a 8th grade students reporting some of the highest ATOD use rates.

In addition, the significant associations between slopes provide evidence for an alternative intervening variable in the form of acculturation stress. Previous research using GST as a framework has primarily considered negative emotions such as anger, anxiety, frustration, and depression (Brezina 1996; Higgins and Gabbidon 2009; Pérez et al. 2008). Although these negative emotions were not measured, precluding direct tests of GST, a strain's (perceived discrimination) indirect association with problem behaviors (ATOD use) through a different type and culturally-based negative response—acculturation stress—was examined. Thus, acculturation stress, as a negative psychological/ affective experience associated with the acculturation process, operated as an intervening variable between the slopes of perceived discrimination and ATOD use, thereby extending GST to a culturally-based potential reaction to strain.

This study's findings also support the fourth hypothesis. Initial levels of perceived discrimination were indirectly related to changes in ATOD use through changes in acculturation stress. This falls in line with Eitle and Turner's (2003) suggestion that strains experienced early on may continue to exert effects years after they occurred. Mexican-heritage youths' initial levels of perceived discrimination at Wave 1 (5th grade) were associated with their increased perceptions of acculturation stress and their increased ATOD use behaviors over time. The long-term associations of perceived discrimination, as demonstrated in the current study, illustrate the gravity and the necessity of prevention efforts to decrease discrimination and to provide healthy coping strategies for Mexican-heritage youth.

Implications for Prevention Research

In their 2004 article in *Prevention Science*, Castro et al. argued for scientifically-based cultural adaptations of prevention interventions that address the needs of different cultural groups and that encourage community participation. Adapting prevention interventions for a specific cultural group involves changing the messages to incorporate important issues that the audience faces in their lives (Castro et al. 2004; Hecht and Krieger 2006). This study revealed that perceived discrimination and acculturation stress place Mexican-heritage youth

at risk for ATOD use. Consequently, a culturally adapted prevention intervention that addresses perceived discrimination, acculturation stress, and ATOD use would likely benefit Mexican-heritage youth, given the relevancy of such topics among this particular group.

As Castro et al. (2004), Dumka et al. (2007), and others have suggested, schools and communities play an important role in addressing perceived discrimination, acculturation stress, and ATOD use through the promotion of multiculturalism and diversity. For example, *Facing History and Ourselves* (FHAO) is a program for middle and high school students that focuses on historical examples of intergroup conflict (e.g., racism, prejudice, anti-Semitism) and social injustice to foster adolescents' perspective-taking, critical thinking, and moral decision-making (Barr 2005). One evaluation demonstrated that students exposed to the FHAO curriculum showed increased relationship maturity, decreases in racist attitudes, and fewer self-reported fighting behaviors (Schultz et al. 2001). Such efforts represent a promising approach to promoting positive interpersonal and intergroup relations.

In addition to developing prevention interventions to reduce discrimination, acculturation stress, and AOTD use, this study's findings also suggest that prevention efforts identify and encourage more effective coping mechanisms for Mexican-heritage youth to deal with discrimination and acculturation stress. For example, parents play an influential role in their children's decision to engage in risky behaviors such as substance use (Miller-Day 2008) and can play a protective role. Consistent with this notion, Shakib et al. (2003) found that Latino/a adolescents were less likely to smoke when they communicated more often with their parents. Parents also may prepare their children by communicating messages specifically about discrimination, ethnic identity, and ethnic pride (Hughes 2003). Through motivating and promoting communication, nurturing parent-child relationships, and preparing children for discrimination, youth are more likely to rely on the support from their parents and be able to discuss their perceived discrimination, acculturation stress, and substance use experiences. Thus, Mexican-heritage youth are likely to benefit from prevention interventions that incorporate parent-child communication and supportive relationships as coping resources.

By addressing these issues that are relevant to Mexican-heritage youth, preventionists also are likely to garner an increase in participation from the community. Although a number of efficacious prevention interventions exist, community adoption of such programs remains limited (Dumka et al. 2007). If members of the community find that prevention interventions address their specific needs, they may be more likely to participate. Moreover, Mexican-heritage youth who receive the intervention also may be more receptive to it, most likely experiencing greater identification with the topics taught in the curricula. One might further speculate that prevention interventions developed through community-based participatory research practices that engage constituencies through cultural grounding may have a better chance of integration into the curriculum (Hecht and Krieger 2006). In short, this study's findings provide empirical and theoretical evidence of perceived discrimination's harmful association with acculturation stress and ATOD use among Mexican-heritage youth, which emphasizes the importance of culturally adapted prevention interventions that meet the needs of this particular group and that encourage participation from the community.

Limitations and Future Research

Despite this study's findings, it is not without limitations. First, the effect sizes for the intercept and slope of ATOD use were small (Cohen 1988). The intercept and slope of acculturation stress had large effect sizes, yet the small effect sizes of ATOD use may have resulted from the small percentage of ATOD use across the six waves. Larger effect sizes are likely to emerge with greater reports of ATOD use frequency as youth age. These small effect sizes are similar to those in the field of substance use prevention among

preadolescents and adolescents (Cleveland et al. 2005; Elek et al. 2006). Further, small effect sizes should not be disregarded in these situations, where the primary focus involves great consequences such as early ATOD use and other risky behaviors (Prentice and Miller 1992). It should also be noted that this study only sheds light on the longitudinal associations among factors, not causality.

Another limitation was that data were collected from Waves 1–6 for acculturation stress and last-30-days ATOD use, but only Waves 1, 4, 5, and 6 for perceived discrimination. This design was necessitated by the overall study goal of evaluating an intervention program that limited questionnaire length. Collins and Graham (2002) discussed the importance of temporal design for longitudinal research in the substance use prevention field. Significant paths between changes in perceived discrimination, acculturation stress, and ATOD use were found, but researchers in the future should consider obtaining more waves of data over regular and perhaps shorter periods, given that Mexican-heritage youth may experience perceived discrimination at different rates and in varying intervals (Araújo and Borrell 2006). Also, with the attrition across the six waves, it should be noted that the missingness may not have been at random, and the findings may not be generalizable to all Mexican-heritage youth.

An additional limitation is in the conceptual similarity between the measures of perceived discrimination and acculturation stress. The acculturation stress measures came from several established scales (e.g., Gil et al. 1994; Mena et al. 1987; Romero and Roberts 2003) that specifically operationalize stress associated with the acculturation process. When designing this study, the project team felt that the use of modified items from several acculturation stress scales better reflected the experiences of participants than any of the scales individually. Inter-item correlations and CFAs provided support for the distinction between the perceived discrimination and acculturation stress measures. Yet, future research would benefit from incorporating more traditionally established scales of acculturation stress that are not only statistically distinct from perceived discrimination but that appear more conceptually distinct as well.

This study also was limited by the exclusion of ethnic identification in relation to Mexican-heritage youths' acculturation, perceived discrimination, acculturation stress, and substance use. Engaging in ethnic identification processes such as labeling oneself as a member of a particular ethnic group, seeking information to learn more about one's ethnic background, and feeling a sense of belongingness to one's ethnic group all may heighten perceptions of discrimination and acculturation stress or may act as protective factors against such negative experiences (Phinney and Ong 2007). Ethnic identification has been a common factor encouraged in culturally adapted prevention interventions (Hecht et al. 2006). Thus, future research would benefit from examining how ethnic identification develops over time, and in turn, is related to youths' perceptions and experiences with discrimination, acculturation stress, and ATOD use.

A final limitation is the lack of variation in the populations at the 29 schools and the surrounding neighborhoods included in this study. At each school and in their corresponding neighborhoods, the majority was comprised of Mexican-heritage youth; hence, these youths' perceived discrimination may be different for Mexican-heritage youth who attend schools where they are in the minority. At Mexican-majority schools, perceived discrimination may occur more often within ethnic groups (i.e., based on generation status, language skills, physical features) than between ethnic groups (Codina and Montalvo 1994; Pérez et al. 2008). Encountering perceived discrimination with members of U.S. mainstream culture, where Mexican-heritage youth are the minority, may highlight differences in cultural

identities and make perceptions of discrimination more salient, thus requiring further investigation.

Concluding Remarks

Guided by GST, this study found evidence for perceived discrimination's (i.e., strain) direct association with Mexican-heritage youths' mental health (e.g., acculturation stress) and indirect association with their health behaviors (e.g., ATOD use) across time. Such findings suggest action in the form of culturally-grounded programs that assist youth in dealing with culturally-related biases while introducing these issues to youth who may engage in discriminatory behavior. Few interventions attend to these cultural needs, but those that have such as *Puentes* (Dilman Carpentier et al. 2007) have demonstrated the efficacy of this strategy. Developing a positive school culture and interpersonal relationships may be another useful strategy because interventions creating cross-cutting, interdependent roles can ameliorate prejudice and discrimination (Marsiglia and Hecht 1998). Strategies that reduce prejudice and discrimination among youth and that help them deal with the associated acculturation stress will benefit our nation's minority youth and begin to address health disparities.

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Fig. 1.

A multivariate growth curve model of perceived discrimination's indirect relation to ATOD use

Note. To account for program effects, paths were estimated from a dummy-coded variable representing the program conditions with all the factors in the model. Religiosity and sex were included as covariates. Path coefficients are completely standardized. All significant ($p < .05$) paths are highlighted by boldface and marked by asterisks ($\chi^2 [215] = 381.35, p < .05$; CFI = .87; RMSEA = .03, 90% CI = .02, .03; SRMR = .05).

Table 1

Descriptive statistics for perceived discrimination, acculturation stress, and last-30-days ATOD use

Variable	Mean (SD)	Cronbach's α
Country of Origin (1 item)	1.27 (.44)	–
Time Spent in the U.S. (1 item)	3.99 (1.3)	–
Language Preference with Family (1 item)	2.59 (1.2)	–
Language Preference with Friends (1 item)	3.35 (.87)	–
Perceived Discrimination (5 items at each wave)		
Wave 1	1.58 (.67)	.84
Wave 4	1.46 (.62)	.89
Wave 5	1.47 (.57)	.85
Wave 6	1.43 (.53)	.83
Acculturation Stress (5 items at each wave)		
Wave 1	1.17 (.29)	.62
Wave 2	1.22 (.40)	.79
Wave 3	1.21 (.37)	.78
Wave 4	1.19 (.36)	.78
Wave 5	1.178 (.35)	.81
Wave 6	1.14 (.30)	.79
Last-30-Days ATOD Use (3 items at each wave)		
Wave 1	1.13 (.47)	.73
Wave 2	1.16 (.49)	.71
Wave 3	1.26 (.68)	.80
Wave 4	1.33 (.75)	.76
Wave 5	1.44 (.87)	.74
Wave 6	1.57 (.98)	.71