

## Acculturation and Substance Use Among Hispanic Early Adolescents: Investigating the Mediating Roles of Acculturative Stress and Self-Esteem

Byron L. Zamboanga · Seth J. Schwartz ·  
Lorna Hernandez Jarvis · Kathryn Van Tyne

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**Abstract** We examined the extent to which Hispanic orientation and American orientation are associated with substance use (cigarette, alcohol, and marijuana) both directly and indirectly through acculturative stress and self-esteem. Participants were 347 Hispanic early adolescents (50.7% male; mean age = 12.57, SD = 0.92, range 11–15) from two middle schools in western Michigan. Findings showed that self-esteem emerged as the most consistent predictor of likelihood and extent of substance use. Ethnic identity was positively related to risk for substance use, and acculturative stress and self-esteem mediated the relationships of Hispanic cultural orientation to alcohol use. Self-esteem was the most important protective factor against substance use, and as such, we conclude that prevention programs designed to address precocious substance use that incorporate a self-esteem building component could prove useful among Hispanic early adolescents residing in monocultural contexts within the United States.

**Keywords** Hispanic · Acculturation · Ethnic identity · Self-esteem ·  
Acculturative stress · Substance use

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B. L. Zamboanga (✉) · K. Van Tyne  
Department of Psychology, Smith College, 44 College Lane, Northampton, MA 01063, USA  
e-mail: bzamboan@smith.edu

S. J. Schwartz  
University of Miami, Miami, FL, USA

L. H. Jarvis  
Hope College, Holland, MI, USA

## Introduction

Hispanics are the largest and fastest growing immigrant group in the United States. As of the 2000 Census, Hispanics comprised nearly 14% of legal U.S. residents (Marotta and Garcia 2003). Furthermore, since 2000, one of every two individuals added to the U.S. population has been Hispanic (Bernstein 2007; Huntington 2004). Hispanics are also a young population, with nearly 40% under the age of 20 (Ramírez and de la Cruz 2003). Hispanic youth and adolescents are important to study not only because they represent a rapidly growing segment of the U.S. population but also because they are at high risk for cigarette, alcohol, and illicit drug use (for a review, see Prado et al. 2008).

### Substance Use Among Hispanic Adolescents

According to the Monitoring the Future data, between 1992 and 2007 (Johnston et al. 2008), Hispanic 8th graders reported relatively higher rates of marijuana and alcohol use compared to similar aged White and Black adolescents. With respect to cigarette use, Hispanic 8th graders reported similar prevalence rates to Whites, both of which were higher than those for Blacks. Research has highlighted the long-term, negative consequences (e.g., substance use dependency, impaired transition to adulthood) of cigarette (Vega and Gil 2005), alcohol (DeWit et al. 2000), and marijuana (Brook et al. 2002) use during the early-adolescent years. Altogether, these findings indicate that Hispanic early adolescents are at elevated risk for substance use and highlight the need for further research on key correlates of substance use in this population (for review of substance use among Hispanic adolescents, see Crockett and Zamboanga in press).

### Acculturation and Substance Use in Hispanic Adolescents

It has been argued that identification with traditional Hispanic values can protect Hispanic adolescents from engaging in illicit substance use (De La Rosa 2002). The term “acculturation” is used to refer to orientations toward both heritage and receiving cultural contexts and practices among immigrants and their descendants (Tadmor and Tetlock 2006). We focus on U.S. Hispanic adolescents in the present paper, and thus the term “acculturation” will be used to refer to orientations toward Hispanic and American cultural contexts and practices. Most studies on acculturation have operationalized the construct only in terms of cultural behaviors such as language use, food preferences, and family and friend relationship styles (Kang 2006). However, given that acculturation includes cultural values and identifications as well as practices (Cabassa 2003; Schwartz et al. 2006b), it is important to consider other relevant dimensions of acculturation. Ethnic identity, for example, refers to a subjective experience of heritage-culture retention (Roberts et al. 1999) as well as the extent to which individuals view their ethnic group positively (Phinney 2003). According to Phinney (2003), ethnic identity is “one aspect of the acculturation process that can be distinguished from other aspects by virtue of its focus on subjective feelings about one’s ethnicity” (p. 65). Moreover, acculturation

and ethnic identity are relevant not only for recent immigrants but also for individuals born in the receiving society (e.g., Ponterotto et al. 2001)—perhaps especially for those who can be visually identified as belonging to an ethnic minority group.

Acculturation and ethnic identity have been linked to substance use among Hispanic adolescents (e.g., Gil et al. 2000; Guilamo-Ramos et al. 2004; Marsiglia et al. 2004; Ramirez et al. 2004). This includes cigarette (e.g., Elder et al. 2000; Marsiglia et al. 2004), marijuana (e.g., Delva et al. 2005; Marsiglia et al. 2004), and alcohol use (Gil et al. 2000; Guilamo-Ramos et al. 2004). For example, some studies have found that low levels of acculturation to American cultural practices are associated with lower levels of substance use (Delva et al. 2005; Gil et al. 2000). In addition, Gonzales et al. (2002) cited four studies indicating that more acculturated adolescents had higher rates of alcohol and drug use (e.g., Brook et al. 1998). However, not all studies support these findings. For instance, other studies found no relationship between these variables (e.g., Elder et al. 2000; see also De La Rosa 2002; Epstein et al. 2001). Thus, the exact role of acculturation in substance use among Hispanic adolescents is unclear and as such, the primary purpose of the present study was to examine the association between acculturation and substance use in a sample of Hispanic early adolescents.

### Acculturation as a Multidimensional Process

There are three points of consideration worth noting with respect to the literature on acculturation and substance use among Hispanic adolescents and emerging adults. First, few studies have focused on empirically delineating between subjective aspects of acculturation (e.g., ethnic identity) and more conventional measures of acculturation (e.g., language use/culturally relevant behaviors) (e.g., Marsiglia et al. 2004; Raffaelli et al. 2005; Zamboanga et al. 2006). Although ethnic identity is related to retention of Hispanic cultural practices (Raffaelli et al. 2005; Schwartz et al. 2007a; Zamboanga et al. 2006), it may be possible to feel a sense of solidarity with one's cultural group without speaking its language, or vice versa (Portes and Rumbaut 2001). Furthermore, unlike behavioral indices of acculturation (Schwartz et al. 2006c), ethnic identity does not appear to be related to demographic measures of acculturation, such as generational status, in any consistent manner (Phinney 2003).

The use of different operational definitions of acculturation may also have contributed to the inconsistent findings on the association between acculturation and substance use among Hispanic adolescents. In essence, ethnic identity and behavioral acculturation represent different aspects of acculturation and conceivably, these indices may be associated with substance use in unique ways. For example, ethnic identity and linguistic acculturation (as measured by English language use with family and friends) have been found to be differentially associated with the use of various substances (i.e., cigarettes, alcohol) among Hispanic early adolescents (Marsiglia et al. 2004). Specifically, Marsiglia et al. (2004) found that a strong sense of ethnic identity was associated with elevated current alcohol and cigarette use in their sample of early adolescents from Mexican backgrounds in the Southwest. Conversely, higher levels of acculturation were

correlated with higher lifetime drug use, but not current drug use (Marsiglia et al. 2004). Another study with Mexican American college students in the Midwest found no relationship between linguistic acculturation and alcohol use; however, findings showed that ethnic identity was associated with higher frequency of heavy alcohol use (Zamboanga et al. 2006). As a result, we draw on multidimensional theories of acculturation and cultural identity (e.g., Phinney 2003; Schwartz and Zamboanga 2008; Schwartz et al. 2007a), which specify that ethnic identity and behavioral preferences represent distinct aspects of the acculturation process. An expanded view of acculturation would consider cultural values and identifications, in addition to practices, as elements of the acculturation process. For example, individuals may identify with their heritage culture (e.g., perceive themselves as being Hispanic) even though they do not speak their heritage language (Portes and Rumbaut 2001). Using only cultural practices to index acculturation may provide an incomplete portrayal of the acculturation process.

The second possible explanation for the mixed findings has to do with how dimensions of acculturation have been (and continue to be) operationalized. Acculturation has been traditionally operationalized as a “unidimensional” continuum ranging from retention of Hispanic values and practices to acquisition of American cultural values and practices (Flannery et al. 2001). More recently, researchers have adopted “bidimensional” models of acculturation where orientations toward Hispanic and American values and practices are considered as separate dimensions (e.g., Ryder et al. 2000). In most of the studies on acculturation and substance use, researchers measured acculturation using unidimensional scales. When acculturation is operationalized unidimensionally, the possibility of endorsing both Hispanic and American cultural practices is not taken into account (Tadmor and Tetlock 2006). That is, biculturalism may represent high levels of endorsement of both Hispanic and American cultural practices, rather than a midpoint between the two. In short, within a simplistic, unidimensional model of acculturation, identifying with one’s Hispanic culture would preclude acculturating to “mainstream” society. A bidimensional model of acculturation, where Hispanic and American cultural influences are considered as separate dimensions, may address these limitations and appears more tenable than the unidimensional approach (Ryder et al. 2000; Schwartz et al. 2007b). As a result, consistent with contemporary acculturation theory (Tadmor and Tetlock 2006), we utilize the bidimensional model of acculturation in the present study.

### Acculturation and Substance Use: Mediating Mechanisms

The third point of consideration regarding the literature on acculturation and substance use among Hispanic adolescents and emerging adults has to do with the limited knowledge of mediating mechanisms between these variables. Research on the association between acculturation and substance use has focused primarily on direct associations. However, it is important that researchers delineate the relationship of acculturation with substance use in Hispanic adolescents—as well as the mechanisms through which these associations may operate (Crockett and Zamboanga in press; De La Rosa 2002; cf. Schwartz et al. 2007a; Zamboanga and

Carlo 2006). If ethnic identity and conventional measures (e.g., language use) of acculturation are found to relate to the use of various substances through different mechanisms, this may provide further evidence for discriminant validity between these dimensions of acculturation. For example, ethnic identity may enhance the self-esteem of ethnic minority adolescents (Umaña-Taylor et al. 2008). Furthermore, given prior research on the protective role of self-esteem against substance use (e.g., Swaim and Wayman 2004), we would expect the relationship between ethnic identity and substance use to operate through self-esteem.

Given that acculturative stress represents negative “side effects” of acculturation such as trauma, anxiety, and disorientation (Finch et al. 2001), it is possible that acculturative stress may link acculturation dynamics to substance use. Such a proposition is tenable given theoretical arguments that Hispanic immigrants may be criticized by their Hispanic-cultural community for acquiring American-cultural practices and criticized by the American-cultural community for retaining Hispanic-cultural practices (Rudmin 2003; Schwartz et al. 2006b). As a result, acculturative stress might be associated with both Hispanic and American cultural orientations, although in a community oriented largely toward American culture, high levels of Hispanic-culture orientation might be most strongly associated with acculturative stress. Acculturative stress, in turn, has been associated with risk for substance use (Gil et al. 2000). Moreover, in more monocultural communities, acculturative stress may be important for second and third generation immigrants, especially those from visible-minority groups and whose names or customs may identify them as belonging to a minority group (cf. Lara et al. 2005).

## Study Hypotheses

The present study was designed to investigate the direct association between acculturation and substance use, as well as the extent to which self-esteem and acculturative stress might mediate such relationships. Despite the cross-sectional design used, we hypothesized paths only in one direction. First, given prior research, we hypothesized that ethnic identity would be negatively associated with substance use and that these relationships would operate through self-esteem. Second, given the monocultural nature of the Midwestern community in which these adolescents lived, we expected that American orientation would be negatively associated with acculturative stress, whereas Hispanic orientation would be positively associated with acculturative stress; and that acculturative stress would be positively related to substance use.

## Method

### Participants

Respondents were part of a larger study ( $N = 904$ ) on adolescent cultural experiences and psychosocial adjustment. Participants were recruited from the two most ethnically diverse middle schools in a small city in western Michigan

(there are two other area schools that are largely non-Hispanic White). The sample included in the present analyses consisted of 347 students who self-identified as Hispanic (38% of the total sample; 170 boys, 163 girls, and 14 unidentified by gender). The study sample was comprised of 6th (29%), 7th (33%), and 8th (37%) graders. Hispanics, and especially Mexican Americans, have resided in this area for at least three generations, though in recent years their prominence and visibility in the area (in the form of cultural events, restaurants, and the like) has increased. The majority (58%) of participants were of Mexican descent, with the remainder having roots in Puerto Rico, Honduras, Chile, Cuba, and other Central and South American countries. Eighty-six percent of adolescents, 58% of mothers, and 50% of fathers were born in the United States. Based on adolescents' and parents' birthplaces, 14% of the sample was comprised of first-generation immigrants, 35% of second-generation immigrants, and 34% of third or later generation immigrants. The remaining 17% of adolescents did not report their own or their parents' birthplaces and could not be classified into an immigrant generation category. The high percentage of U.S.-born adolescents in the sample is likely due to most Hispanic immigrants to this area arriving as young adults or as couples without children and starting families later.

## Procedures

The primary investigator (L.H.J.), in collaboration with the school principals, sent letters to the parents of students enrolled in the two middle schools, explaining the aims and procedures of the study. Parents were asked to return the letter if they did not want their son or daughter to participate in the study ( $n = 12$ ). Students whose letters were undeliverable ( $n = 16$ ), as well as those with limited English skills ( $n = 15$ ), were not included in the study because the assessments were conducted in English. Data collection occurred during one class period. Five students decided not to participate in the study during the data collection phase. Completion rates ranged from 67% (self-esteem) to 100% (lifetime alcohol use), with a mean of 86.3%.

## Measures

### *Behavioral Acculturation*

Behavioral acculturation was measured using the youth version of the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II; Cuéllar et al. 1995). The terms "Mexican" and "Mexican American" were changed to "Hispanic/Latino" so that the measure would apply to Hispanics from various national origins. This measure contains 12 items, 6 of which assess American orientation (e.g., "I enjoy listening to English-language music") and 6 of which assess Hispanic orientation (e.g., "I associate with other Hispanics/Latinos"). Participants were asked to respond to each item using a five-point scale ranging from 1 (*Not At All*) to 5 (*Extremely Often/Always*). In the present study, Cronbach's alpha coefficients for scores on the American and Hispanic orientation scales were .65 and .91, respectively.

### *Ethnic Identity*

Ethnic identity was assessed using the Multi-Group Ethnic Identity Measure (Roberts et al. 1999), which measures two aspects of ethnic identity. Ethnic identity achievement (seven items; e.g., “I have spent time trying to find out more about my ethnic group, such as its history, traditions, and customs”) represents having considered the subjective meaning of one’s ethnicity. Ethnic identity affirmation (five items; e.g., “I have a lot of pride in my ethnic group”) represents identifying with and valuing one’s ethnic group. Following Roberts et al. (1999), these two subscales were summed to create a total ethnic identity score. Participants were asked to indicate their responses on a four-point scale ranging from 1 (*Strongly Disagree*) to 4 (*Strongly Agree*). In the present sample, Cronbach’s alpha was .84.

### *Acculturative Stress*

Acculturative stress was measured using the Process-Oriented Stress subscale from the Societal, Attitudinal, Familial, and Environmental Acculturative Stress Scale for Children (SAFE-C; Chávez et al. 1997). The SAFE-C asks participants to indicate, using a six-point scale ranging from 0 (*Does Not Apply*) to 5 (*Bothers Me a Lot*), the extent to which they agree with statements such as, “I have a hard time understanding what others say when they speak” and “It bothers me that I have an accent.” Although acculturative stress is often thought of as applying mostly to recent immigrants, measures of acculturative stress may be applicable to later-generation as well as first-generation immigrants (e.g., Hovey and King 1996), especially those from visible-minority groups. The Cronbach’s alpha coefficient for SAFE-C scores in the present sample was .88.

### *Self-Esteem*

The 10-item Rosenberg (1965) Self-Esteem Scale was used to assess self-esteem. Five of the items are worded positively (e.g., “On the whole, I am satisfied with myself”), and five are worded negatively (e.g., “I feel I do not have much to be proud of”). Participants rate each statement as either true or false, and the subscale score is the sum of “true” responses (with items reverse-scored as appropriate). In the current sample, Cronbach’s alpha was .80.

### *Cigarette, Alcohol, and Marijuana Use*

We included two questions, adapted from the Centers for Disease Control and Prevention (2001), indexing (a) the number of times the adolescent had consumed beer or wine coolers and (b) the number of times the adolescent had consumed hard liquor. For cigarette use, we asked how many times the adolescent had smoked cigarettes (even just a few puffs). For marijuana, we asked how many times the adolescent had smoked marijuana. A seven-point response scale was used for all of these items: 1 = *Never*, 2 = *Once or Twice*, 3 = *3 to 9 Times*, 4 = *10 to 19 Times*,

5 = 20 to 39 Times, 6 = 40 to 99 Times, and 7 = 100 or More Times. We summed the two alcohol use items to create a composite lifetime alcohol use score.

Because the alcohol use items were both responded to using 7-point scales, possible scores for each item response ranged from 1 to 7. Summing the two responses together therefore yielded a score with a range of 2 to 14. We subtracted two from each participant's score so that the possible scores would range from 0 to 12. Including zero as a possible score is extremely important when modeling data that are heavily positively skewed and follow a Poisson distribution (Atkins and Gallop 2007). For Poisson-distributed variables, zero is almost always the most frequently occurring score, and if the zeroes represent more than a given amount (e.g., 70%) of the distribution, the zeroes may need to be modeled separately from the nonzero count data (Clark 2005). We explain this analytic approach below.

#### Analytic Strategy: Cigarette, Alcohol, and Marijuana Use as Zero-Inflated Count Variables

First, we conducted a series of analyses of variance and Chi-squares to ensure that we could safely combine participants across the two schools. There were no significant differences by school in any of our continuous variables, Wilks'  $\lambda = .97$ ,  $F(5, 175) = 1.15$ ,  $p = .34$ ,  $\eta^2 = .03$ ; in likelihood of alcohol use,  $\chi^2(2) = 0.27$ ,  $p = .60$ ; in likelihood of cigarette use,  $\chi^2(2) = 2.46$ ,  $p = .11$ ; or in likelihood of marijuana use,  $\chi^2(2) = 0.03$ ,  $p = .86$ . We therefore combined data across schools.

Second, given the preponderance of zeroes among the cigarette, alcohol, and marijuana use scores, we modeled these scores as zero-inflated count variables (Atkins and Gallop 2007). Because a variable in which more than two-thirds of responses are zero is unlikely to yield significant results, we split the each of the substance use variables into two separate indicators—a dichotomous variables reflecting whether or not the participant had ever used the substance in question, and a count variable representing the number of times the participant reported having used the substance in her/his lifetime (on a scale of 1–12). The dichotomous variable therefore represents the *likelihood* of use, whereas the count variables represent the *extent* of use for those individuals reporting at least some use. It should be noted that both the “likelihood” and “extent” variables were derived from the original substance use variable. For participants who indicated no use of the substance in question, the count variable was specified as missing. This type of parameterization is necessary to set up a zero-inflated Poisson (ZIP) model. Paths to the dichotomous indicator are interpreted as odds ratios (OR)—the multiplicative increase in the likelihood of alcohol use given a one-unit increase in the predictor variable. Paths to the count variable are interpreted as incidence rate ratios (IRR)—the multiplicative increase in the expected count for substance use given a one-unit increase in the predictor variable. Paths to the count variable can be interpreted only for participants reporting use of the substance in question. The null hypothesis for OR and IRR values is 1, and as a result, values below 1 indicate a negative relationship, whereas values above 1 indicate a positive relationship. All structural models were estimated using Mplus release 5.1 (Muthén and Muthén 2007), with robust maximum likelihood estimation used to handle non-normality in the data.

## Results

### Descriptive Statistics and Bivariate Correlations

Table 1 presents descriptive statistics for, and bivariate correlations among, continuous study variables. American and Hispanic orientations were moderately and negatively related, and Hispanic orientation was moderately and positively related to ethnic identity. Acculturative stress was positively related to Hispanic orientation but negatively related to self-esteem. Not surprisingly, the vast majority of participants who answered the substance use questions indicated no lifetime cigarette (83%), alcohol (66%), or marijuana (91%) use.

### Structural Model

#### *Direct Effects Model*

Following Holmbeck (1997), we first estimated a “direct effects” model without the hypothesized mediators (see Fig. 1). In this model, only American orientation, Hispanic orientation, and ethnic identity were allowed to predict the cigarette, alcohol, and marijuana use variables. In this model, American orientation was negatively related to extent of marijuana use,  $IRR = 0.75$ ,  $p < .05$ . Hispanic orientation was negatively related to extent of cigarette use,  $IRR = 0.84$ ,  $p < .05$ , but positively related to extent of marijuana use,  $IRR = 1.17$ ,  $p < .05$ . Ethnic identity was significantly and positively related to extent of cigarette use,  $IRR = 1.05$ ,  $p < .01$ , and it approached significance as a positive predictor of the extent of alcohol use,  $IRR = 1.05$ ,  $p < .07$ , and of likelihood of marijuana use,  $OR = 1.05$ ,  $p < .07$ .

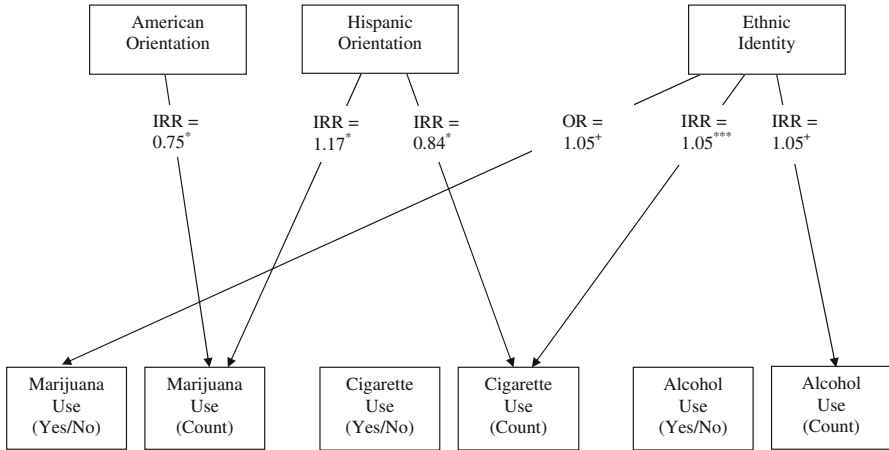
#### *Mediational Model*

We then added the hypothesized mediators—self-esteem and acculturative stress—and reestimated the model (see Fig. 2). Self-esteem was significantly and negatively related to all of the outcomes, except for extent of cigarette use: likelihood of cigarette use,  $OR = 0.75$ ,  $p < .01$ ; likelihood of alcohol use,  $OR = 0.84$ ,  $p < .05$ ;

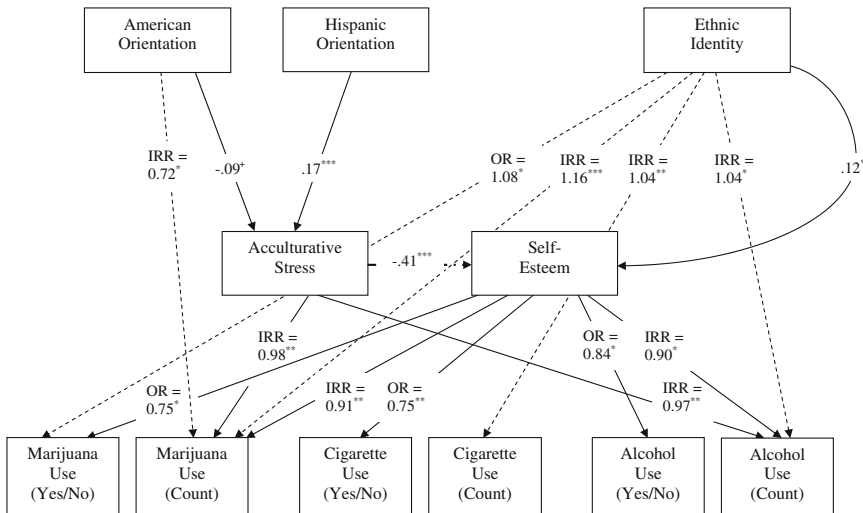
**Table 1** Descriptive statistics and bivariate correlations among study variables

Variable	Mean (SD)	2	3	4	5
1. American orientation	24.92 (3.61)	-.27***	.01	-.03	-.11
2. Hispanic orientation	16.77 (7.07)	–	.34***	.06	.23***
3. Ethnic identity	35.54 (6.46)		–	.14*	.07
4. Self-esteem	7.72 (2.37)			–	-.37***
5. Acculturative stress	24.17 (13.39)				–

*Note:* The mean values reported above are derived from summing responses across the items on each measure. \*  $p < .05$ , \*\*\*  $p < .001$



**Fig. 1** Direct-effects model. (1) Only significant paths are displayed. <sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*\*  $p < .001$ . (2) Sample sizes for count variables: marijuana use,  $n = 29$ ; alcohol use,  $n = 104$ ; cigarette use,  $n = 52$ . (3) “Yes/No” refers to whether or not the person has used the substance in question during her/his lifetime. “Count” refers to, for those participants reporting use, how much they have used in their lifetime



**Fig. 2** Mediation model. (1) Significant direct paths are displayed using dashed lines. Nonsignificant direct paths are not displayed. <sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . (2) Sample sizes for count variables: marijuana use,  $n = 29$ ; alcohol use,  $n = 104$ ; cigarette use,  $n = 52$ . (3) “Yes/No” refers to whether or not the person has used the substance in question during her/his lifetime. “Count” refers to, for those participants reporting use, how much they have used in their lifetime

extent of alcohol use,  $IRR = 0.90$ ,  $p < .05$ ; likelihood of marijuana use,  $OR = 0.75$ ,  $p < .05$ ; and extent of marijuana use,  $IRR = 0.91$ ,  $p < .01$ . Ethnic identity was positively related to extent of cigarette ( $IRR = 1.04$ ,  $p < .01$ ), alcohol

( $IRR = 1.04, p < .05$ ), and marijuana ( $IRR = 1.16, p < .001$ ) use, as well as to likelihood of marijuana use ( $OR = 1.08, p < .05$ ). Acculturative stress was negatively related to extent of alcohol ( $IRR = 0.97, p < .05$ ) and marijuana ( $IRR = 0.98, p < .05$ ) use. Among the acculturation variables, American orientation was related only to extent of marijuana use (in a negative direction;  $IRR = 0.72, p < .05$ ), and Hispanic orientation was not significantly related to any of the substance use outcomes.

To evaluate the extent to which our model was able to predict both users and non-users of cigarettes, alcohol, and marijuana, we conducted a series of follow-up logistic regression analyses using SPSS for Windows version 16. For all three substances, the regression algorithm was able to correctly classify all of the non-users, but not able to correctly classify any of the users. However, the ZIP model approach does help to correct for this by modeling *likelihood* and *extent* of use as separate indicators. Nonetheless, the small sample size limits the conclusions that can be drawn regarding predictors of *extent* of use. This is especially true regarding marijuana use, in which only 29 participants reported engaging.

### *Mediational Findings*

Following Schwartz et al. (2007a), we then proceeded to examine the extent to which self-esteem and acculturative stress would mediate the associations of ethnic identity and acculturation, respectively, to alcohol use. We focused on alcohol because it was the most commonly used substance in our sample and provides sufficient statistical power for tests of mediation. We used the asymmetric distribution of products test (MacKinnon 2008), which is designed to examine the extent to which the indirect relationship between two variables operates through a third variable. This test is by far the most powerful test of mediation (Fritz and MacKinnon 2007). However, because this test relies on the product of the two paths that make up the mediating sequence, it often involves multiplying two fractional numbers—which results in a smaller number as the product and requires more statistical power to detect significance.

Unlike the traditional Baron and Kenny (1986) test for mediation, the asymmetric distribution of products test can test more than one mediating sequence at a time, and the direct relationship does not have to be statistically significant for mediation to be assumed. For example, there may be cases where the relationship between two variables operates largely through a third variable, and the direct relationship is not statistically significant (e.g., Schwartz et al. 2009). The asymmetric distribution of products test constructs a 95% confidence interval around the product of the two unstandardized coefficients that comprise the mediational sequence. If this confidence interval does not include zero, partial mediation is assumed at  $p < .05$ . Since we were using dichotomous and count dependent variables, and because a logistic or Poisson regression coefficient of zero is equivalent to an  $OR$  or  $IRR$  of 1, confidence intervals that did not include 1 were taken as indicative of mediation. The path from American orientation to acculturative stress approached significance ( $\beta = -.09, p = .061$ ); as such, we included this path in tests of mediation.

**Table 2** Mediated effects through acculturative stress and self-esteem

Independent variable	Dependent variable	Mediation point estimate ( <i>OR/IRR</i> )	95% CI (lower) <i>OR/IRR</i>	95% CI (upper) <i>OR/IRR</i>
American orientation	Alcohol use (yes/no)	0.96	0.93	0.99
American orientation	Alcohol use (count)	0.98	0.96	0.99
Hispanic orientation	Alcohol use (yes/no)	1.03	1.01	1.16
Hispanic orientation	Alcohol use (count)	1.02	1.01	1.04

Self-esteem was found to partially mediate the association of ethnic identity to the likelihood of alcohol use (point estimate  $OR = 0.991$ , 95% CI = 0.983 to 0.999). Among those participants reporting alcohol use, acculturative stress partially mediated the associations between (a) American orientation and extent of alcohol use (point estimate  $IRR = 1.10$ , 95% CI = 1.02 to 1.18) and (b) between Hispanic orientation and extent of alcohol use (point estimate  $IRR = 0.93$ , 95% CI = 0.88 to 0.97).

Following Schwartz et al. (2007a), we then examined the extent to which both acculturative stress and self-esteem may have mediated the relationships of Hispanic and American cultural orientations to alcohol use (see Table 2). The asymmetric distribution of products test is also appropriate for use with multiple-mediator sequences, and analyses with multiple mediators operate similarly to those with a single mediating variable (Taylor et al. 2008). Results indicated that acculturative stress and self-esteem partially mediated the relationships of American and Hispanic orientation to the likelihood and the extent of alcohol use.

As a final step of analysis, we tested whether the models were fully invariant across gender, across schools, and across grade in school. Results indicated full invariance across gender,  $\chi^2(31) = 25.11$ ,  $p = .74$ ; across schools,  $\chi^2(34) = 31.91$ ,  $p = .57$ ; and across grade in school,  $\chi^2(68) = 55.00$ ,  $p = .87$ .

## Discussion

We designed the present study to examine the extent to which acculturation is related to substance use (cigarettes, alcohol, marijuana) in a sample of Hispanic early adolescents, as well as the mediating role of acculturative stress and self-esteem in these associations. We conducted our study with Hispanic early adolescents from a small Midwestern community where Hispanic immigration is less widespread than in other parts of the country. Our direct effects model showed that ethnic identity was positively associated with likelihood of marijuana use and with the extent of cigarette and alcohol use, that Hispanic orientation was positively associated with extent of marijuana use but negatively associated with extent of cigarette use, and that American orientation was negatively associated with extent of marijuana use. The finding that ethnic identity represents a risk for substance use is consistent (with the exception of marijuana use) with Marsiglia et al.'s (2004) study with early adolescents from Mexican backgrounds, which showed that a

strong sense of ethnic identity was associated with elevated current alcohol and cigarette use. It is also consistent with another study conducted with Hispanic college students (e.g., Zamboanga et al. 2006) that found positive associations between ethnic identity and alcohol use. These interpretations, however, should be considered in light of the caveat that we were able to correctly classify only those participants who did *not* engage in cigarette, alcohol, or marijuana use.

Results from the mediational model indicated that acculturative stress was largely responsible for the association of Hispanic orientation to the extent of alcohol use, and that both acculturative stress and self-esteem (double-mediation effect) were largely responsible for the association of American orientation to the likelihood and extent of alcohol use. (We were not able to test for mediation for cigarettes and marijuana because of low base rates.) Interestingly, the direct relationship of acculturative stress to the extent of alcohol and marijuana use was negative, suggesting that greater amounts of acculturative stress were associated with lower degrees of substance use. However, it should be kept in mind that this finding is only applicable to the fairly small percentage of adolescents who reported use of alcohol or marijuana. Apparently, among adolescents who had consumed alcohol or marijuana, those with greater degrees of acculturative stress may have been more likely to limit their consumption. It is possible that for these early adolescents, the extent of marijuana and alcohol use is an effort to “fit in” with an American majority culture in a small, monocultural Midwestern community that advocates strong proscriptions against substance use. However, we did not measure perceived proscriptive and prescriptive norms regarding substance use. Given the small sample size and preliminary nature of the study, more research is needed that examines culture-specific prescriptive and proscriptive norms regarding substance use across ethnic groups in various communities.

The mediational findings involving both self-esteem and acculturative stress may be even more complex. The relationship between acculturative stress and self-esteem was fairly strong and negative, and self-esteem was negatively related to both the likelihood and extent of alcohol use. This suggests that the indirect relationship of acculturative stress to the likelihood and extent of alcohol use, through self-esteem, was positive. Moreover, given the positive relationship of Hispanic orientation and the negative relationship of American orientation to acculturative stress, it is not surprising that the indirect relationships of American and Hispanic orientations to alcohol use tended to be negative and positive, respectively. In the small, Midwestern monocultural community in which the present study was conducted, endorsing American cultural practices appeared to be indirectly protective against alcohol use, whereas endorsing Hispanic cultural practices appeared to represent an indirect risk for this substance. The present findings shed light on the need to model likelihood and extent of engagement separately for low-frequency behaviors such as alcohol use—especially in early adolescence (Atkins and Gallop 2007). Had we used simple count variables, we would likely have obtained few or no results, due to the overrepresentation of zeroes among the responses for the substance use variables.

Self-esteem was one of the most robust predictors in the present results. Adolescents with higher self-esteem appeared to be less likely to have smoked

cigarettes, drank alcohol, or used marijuana, and among those adolescents who have used alcohol and marijuana, those with higher self-esteem were more likely to have limited the extent of their use. These findings are consistent with other research (e.g., Donnellan et al. 2005; Schwartz et al. 2006a) suggesting that, in both Hispanic and general-population samples of adolescents, a favorable sense of self is protective against problematic behavior. The present results extend this pattern of prior findings to cigarette, alcohol, and marijuana use as well.

It is also noteworthy that a significant negative relationship between American orientation and extent of marijuana use remained significant even when acculturative stress and self-esteem were included in the model as mediators. Indeed, all of the significant direct and indirect relationships of American orientation to the substance use variables use were negative. This is inconsistent with prior studies reporting that, among Hispanics, acculturation to American cultural practices is “hazardous to one’s health” (Gil et al. 2000; Ramirez et al. 2004; Unger et al. 2004). However, many of these prior studies have utilized unidimensional conceptualizations—and measures—of acculturation where adopting American cultural practices is assumed to be synonymous with discarding Hispanic cultural practices. As Sullivan et al. (2007) found, risks for problematic outcomes may be more closely associated with discarding Hispanic cultural practices than with adopting American cultural practices—and as a result, becoming “American” may not necessarily pose a risk.

The findings for Hispanic cultural orientation were only somewhat parallel to those for ethnic identity. Hispanic orientation was positively related to extent of marijuana use for adolescents who reported any lifetime marijuana use. Although Hispanic orientation was negatively associated with extent of cigarette use, ethnic identity was positively related to extent of cigarette use. In the direct-effects model, among those adolescents who reported having smoked cigarettes during their lifetimes, Hispanic cultural orientation was associated with less cigarette use, whereas ethnic identity was associated with greater use. The observed correlation between ethnic identity and Hispanic cultural orientation ( $r = .34$ ) suggests that these constructs are largely independent, and that acculturation is clearly a multidimensional process, which a majority of prior studies do not consider (see Cabassa 2003; Schwartz et al. 2006b, for further discussion). The different findings for cultural identifications (ethnic identity) versus practices (behavioral acculturation) support the development and use of a multidimensional conception of acculturation where the process of cultural adaptation is viewed as the confluence of practices, values, and identifications (cf. Schwartz et al. 2006b). Using only cultural practices to operationalize acculturation may have masked some of the differential findings that emerged in the present study, and may do so in other studies as well.

Finally, in order to enhance the statistical validity of the present results, we modeled cigarette use, alcohol use, and marijuana use in their natural metrics—as zero-inflated count variables—rather than attempting to transform or rescale them to meet the assumptions of more commonly used statistical analyses (cf. Atkins and Gallop 2007). Indeed, given the overwhelming majority of adolescents reporting no use of any of these substances, the extreme positive skew would most likely have precluded obtaining findings with continuous measures of substance use. Moreover,

had we used only dichotomous indicators for each of these drugs, we would likely have obtained largely nonsignificant results—given that analyses using dichotomous variables tend to be low in power (MacCallum et al. 2002). The relatively low power inherent in dichotomous variables may have also contributed to our finding stronger and more significant effects for extent of use (as a count variable) than for likelihood of use (as a dichotomous variable), across substances.

### Limitations

The present results should be considered in light of several limitations. First, although cross-sectional studies can be useful for mapping relationships among variables, and although we were able to reject two competing models as explanations of our data, cross-sectional studies do not provide empirical guidance regarding causality or sequentiality (Kraemer et al. 2000). Second, excluding participants with limited English ability did not allow us to study the full range of acculturation. Third, all of the measures we used were self-reports from the adolescents themselves. As a result, some of the results may have capitalized on “shared method variance” involved in utilizing multiple variables drawn from the same reporter. Self-reports may also be vulnerable to socially desirable responding. Fourth, the lower-than-expected internal consistency estimate for the American orientation subscale on the ARSMA-I: may have resulted from some students’ lack of familiarity with the word “Anglo,” which is embedded in many of the American orientation items. Moreover, offering only an English version of the survey could have biased the sample to higher acculturated youth as well. Fifth, we acknowledge that a small percentage of the sample reported marijuana use as well as cigarette use; therefore, caution must be used in interpreting the findings. The final limitation concerns the heterogeneity subsumed under the panethnic term “Hispanic.” There is a great deal of variability among individuals of Spanish-speaking descent in terms of skin tone, national origin, socioeconomic status, and ability to “fit into” mainstream U.S. society. Where possible, separate analyses should be conducted by nativity, country of origin, and skin tone, to ascertain the moderating roles of these variables in the relationship of acculturation to cigarette, alcohol, and marijuana use.

### Conclusions and Implications for Prevention

Despite the limitations noted above, the present results help to shed light on the mechanisms through which dimensions of acculturation may be differentially related to substance use. Contrary to what Schwartz et al. (2007a) found for prosocial behavior, academic grades, and externalizing problems, the relationships of ethnic identity to substance use tended to be direct, whereas relationships of acculturation to substance use (with the exception of American cultural orientation and extent of marijuana use) were mediated through acculturative stress and self-esteem. It appears that being Hispanic-identified in a fairly small, Midwestern monocultural community may represent somewhat of a risk for substance use—especially for greater amounts of use among those individuals who have already initiated use—because it is associated with acculturative stress and may be related

to compromised self-esteem. Perhaps in this context, American identification is protective and Hispanic identification is a risk for substance use. Although the association between ethnic identity and self-esteem has been well established (e.g., Phinney et al. 1997; Umaña-Taylor 2004), researchers have only begun to investigate the relationship of behavioral acculturation to self-esteem.

There are several noteworthy points regarding our finding that self-esteem was most proximal to the substance use indices. First, higher levels of acculturative stress were associated with lower self-esteem, and low self-esteem was in turn, related to an increased likelihood and the extent of both marijuana and alcohol use as well as likelihood of cigarette use. Thus, while acculturative stress may be slightly protective for those who already initiated substance use, it can be problematic because of its relationship to low self-esteem. Second, while having a strong sense of ethnic identity is not directly protective against substance use, it may be protective through its positive effect on self-esteem. Perhaps prevention programs that incorporate self-esteem building components could prove useful in addressing precocious substance use in this population. It remains unclear whether integration of intervention components designed to slow or promote acculturation could be useful due to the limited sample size of those who reported substance use and the preliminary nature of our study. Thus, the mechanisms through which a healthy sense of self can be facilitated—including but not limited to cultural mechanisms—in Hispanic early adolescents are in need of further study. We hope that these findings will inspire such future research, as well as contribute to the design of interventions to promote self-esteem—in an effort to prevent early substance use in young Hispanic adolescents residing in monocultural contexts within the United States.

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