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PARENTAL MONITORING, PEER DRUG INVOLVEMENT, AND MARIJUANA USE ACROSS THREE ETHNICITIES

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The purposes of the present study were to test differences in parental monitoring and marijuana use rates and relationships among constructs across three ethnicities, and to use Structural Equation Modeling (SEM) and Van de Vijver and Leung's Analysis of Variance (ANOVA) technique to test for cultural equivalence and item bias in the measurement of these constructs. Participants included 7,500 Mexican American, African American, and non-Hispanic White 10th-12th graders. African American participants showed higher levels of parental monitoring, lower levels of marijuana use, and a stronger relationship between parental monitoring and peer influence. SEM results indicated lack of cultural equivalence for each latent factor. ANOVA results indicated item bias for specific items. Putative cultural differences in the relations between parental monitoring and peer influence, as well as potential sources of bias in measuring family, peer, and drug involvement factors among participants from different cultural groups are discussed.

Keywords: Marijuana; measurement invariance; parental monitoring; peer influence

Family practices have been shown to be strong predictors of adolescent substance use and initiation (Blanton, Gibbons, Gerrard, Conger, & Smith, 1997; Flannery, Williams, and Vazsonyi, 1999; Oetting & Beauvais, 1987). For theoretical as well as prevention purposes, it is important to determine whether these factors operate similarly across ethnic groups. First, cultural differences in ethnic groups may lead familial factors to have a larger effect on adolescent risk behaviors for some groups more than others. For example, it has been suggested that lower drug use rates among African American youth may be because of stronger family influences and monitoring in African American families (Wallace, 1999). Second, differences in how these familial factors are defined and measured may complicate research in this area and the interpretation of results. The purpose of the current study was to test for cultural differences in parental monitoring, peer influence, and marijuana use, as well as their interrelations, and to use structural equation modeling and analysis of variance (ANOVA) techniques to examine measurement invariance in these constructs among African American, non-Hispanic White, and Mexican American 10th-12th-grade students.

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There is evidence that the family practice of parental monitoring in particular is a critical element in preventing substance use (Dishion & Loeber, 1985; Fletcher, Darling, & Steinberg, 1995; Lockman, 2003; Stanton et al., 2002; Steinberg, 1987; Stewart & Bolland, 2002). As proposed by primary socialization theory/peer cluster theory (Oetting & Beauvais, 1986; Oetting & Donnermeyer, 1998) and Snyder, Dishion, and Patterson (1986), family factors primarily influence substance use prevention through affecting youths' involvement with drug-using peers, which then directly influences drug use and involvement. This is largely supported empirically (Blanton et al., 1997; Oetting & Beauvais, 1987) and is considered to hold for parental monitoring as well (Flannery, Williams, & Vazsonyi, 1999; Fridrich & Flannery, 1995; Guo, Hill, Hawkins, Catalano, & Abbott, 2002; Hops, Andrews, Duncan, Duncan, & Tildesley, 2000; Patterson & Dishion, 1985; Snyder et al., 1986).

The effects of parental monitoring and peer influence are not restricted to non-Hispanic White samples. Parental monitoring has been found to operate through peer influence to predict delinquency (Fridrich & Flannery, 1995) and grades (Rodriguez, 2002) among Mexican American youth. Among African American adolescents, parental monitoring has also been found to predict substance use (Bray, Adams, Getz, & Stovall, 2001; Cleveland, Gibbons, Gerrard, Pomery, & Brody, 2005; Stewart & Bolland, 2002) and delinquency (Salem, Zimmerman, & Notaro, 1998).

Given the evidence that parental monitoring and peer factors are important among not only non-Hispanic Whites, but among other ethnicities as well, some researchers speculate as to whether these factors or their relationships could account for differential rates of substance use among ethnicities. Wallace (1999) speculated that parental monitoring in particular could account for the findings that African Americans typically report lower substance initiation and use rates (Barnes, Farrell, & Banerjee, 1994; Beck, Shattuck, Haynie, Crump, & Simons-Morton, 1999; Catalano et al., 1993; Gillmore et al., 1990; Guo et al., 2002; Oetting & Beauvais, 1990) than non-Hispanic Whites.

Among the few ethnic studies that specifically include parental monitoring, the results have been mixed. Catalano et al. (1992) found a stronger relationship between family factors and drug use for African Americans than for non-Hispanic Whites, particularly the factor most closely related to parental monitoring behavior, deciding which friends the child sees. Other studies, however, find differences in the opposite direction: Guo et al. (2002) found that family monitoring was more predictive of illicit drug initiation for non-Hispanic Whites than African Americans. Similarly, Beck et al. (1999) used parent reports of their monitoring and found a relationship between parental monitoring and teen drinking for non-Hispanic Whites only, with no such relationship among African Americans. On the other hand, many studies find no differences across ethnicity (Barrera, Castro, & Biglan, 1999; Bray et al., 2001; Catalano et al., 1993; Goldstein, Davis-Kean, & Eccles, 2005; Guo et al., 2002; Peterson, Hawkins, Abbott, & Catalano 1994). The first purpose of the present study is to test for differences across ethnicities in marijuana use and to determine whether, in addition to mean differences, differences in the *relationship* magnitude between parental monitoring and drug use variables may be stronger among African American participants.

MEASUREMENT INVARIANCE

One possibility for the inconsistency in results for ethnic differences is that it is because of problems with measurement equivalence or biased measurement in parental monitoring. Van de Vijver and Leung (2000) assert that lack of attention to equivalence and bias is a

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major impediment to progress in cross-cultural research, and we believe it is one of the serious limitations of previous research on parental monitoring and substance use across ethnicities. Gottfredson and Koper (1997) point out that if construct measurement invariance is not first established across groups, differences across groups in structural paths from one predictor to an outcome variable are not interpretable. This is especially true for cross-cultural research (Van de Vijver & Leung, 2001); if equivalence is not established prior to comparisons of relationships across cultures, it is highly possible that statistical differences across cultures are because of bias rather than cultural differences of interest. In other words, structural paths may differ because of differences in measurement of the variables of interest, rather than differences in the relationship between the variables. Bias is defined as "a lack of similarity of psychological meaning of test scores across cultural groups" (Van de Vijver, 2000, p. 88). This is an especially important and relevant point when dealing with comparisons across ethnic groups (Trimble, 2005). Three types of bias can occur in cross-cultural research (Malpass & Poortinga, 1986; Van de Vijver & Leung, 1997; Van de Vijver & Leung, 2001; Byrne & Watkins, 2003), and thus could be playing a role in the aforementioned research on family factors and prevention. The first is construct or universe bias, which occurs when the constructs of interest take a different form across cultural groups, or are otherwise not equivalently or adequately measured using the same items or dimensions. The second is method bias, which may occur because of differences in the samples on other characteristics or because of how a test is administered or characteristics of the questionnaire itself, which lead the participants to respond differently across groups. The third is item or stimulus bias (also known as differential item functioning), such as when the wording of an item applies differently to the different cultural groups or makes sense/applies to the construct of interest for some groups and not others. Each of these types of bias threatens cross-cultural cultural equivalence in cross-cultural research. Therefore, attending to equivalence before making conclusions or interpretations of comparisons across cultural groups is important.

Only a handful of investigators have addressed the issue of equivalence in family, peer, and drug use measurement across ethnic groups commonly compared in prevention research. Gottfredson and Koper (1997) tested for measurement invariance in risk variables among African American and non-Hispanic White samples. Although they concluded that risk and drug use variables were measured similarly overall, they found evidence of lack of measurement invariance in peer modeling and drug use items. In a similar study, Rosay, Gottfredson, Armstrong, and Harmon (2000) also found differences across ethnicities in measures of parental and peer influence variables, although they concluded that these differences were substantively trivial. However, other than these few studies, out of the many studies interested in parental monitoring and family factors and their relationships to drug use across ethnic groups, there is a lack of attention to the question of equivalence.

Structural equation modeling has been proposed as one sophisticated technique for testing for equivalence (Van de Vijver & Leung, 2000; Trimble, 2005) and has proven useful for this purpose in recent research (Spini, 2003; Byrne & Watkins, 2003). Van de Vijver and Leung (1997) also propose a technique for testing for item bias using ANOVA, which may be a more sensitive test and provide more detailed information about bias than structural equation modeling (SEM) procedures (Byrne & Watkins, 2003). Thus, a second purpose of the present study is to use SEM and ANOVA procedures to test for ethnic differences and item bias in the relationship of parental monitoring to risk and outcome variables for marijuana use among 10th-12th-grade African American, non-Hispanic White, and Mexican American students. Through determining whether measurement of

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these constructs is equivalent across groups, and identifying possible sources of bias, understanding of the extent to which theoretical or prevention models and techniques can be applied across cultures will be enhanced, and cultural sensitivity in interpreting previous research across cultures in this topic will be improved.

METHOD

PARTICIPANTS

The data used in this study were selected from data for a larger project involving drug use among adolescents. These data were collected from a sample of 193 communities within the contiguous United States, excluding California and Utah. Communities were stratified into four regions of the United States based on FBI crime report regional definitions (West, South, Midwest, and Northeast). Predominantly White communities within each of the rurality categories were proportionately drawn to their representation in each region. Within each community, surveys were administered at a single high school (that was determined to be the most representative of the community) and the feeder junior high school(s). The final sample consisted of 181,351 students in grades 7 through 12.

For the present analysis, responses from 7,500 male and female 10th-12th graders were randomly selected from the larger data set to avoid the problem of having too much power that would overestimate trivial differences. Only complete cases were selected; 46.8 percent were male and 53.2 percent female. The average age of participants was 16 years, 6 months; the range was from 11 years to 21 years. One third of the participants were Mexican American, one third were African-American, and one third were non-Hispanic White.

MATERIALS

Students were given the Community Drug and Alcohol Survey[1]. This is a 99-item survey that asks a variety of questions related to substance use by the student and by his or her peer groups, school adjustment, crime and violence, religion, relationships with family and peers, and other individual and community risk factors in substance use. Items selected for the present analysis were those involving parental monitoring, perceived peer influence/involvement, and marijuana involvement.

Parental monitoring consisted of four items ($\alpha = .81$), including "My parents allow me to go out as often as I want," "My parents let me go any place I want without asking," "My parents are less strict than most parents in letting me have fun with my friends," and "My parents let me stay out as late as I want to" (rated on a 4-point scale from 1 = *very true* to 4 = *not at all true*). Therefore, higher scores indicate greater levels of parental monitoring because of reverse wording of the response options where 1 signifies *very true that parents are less strict* and 4 signifies *not at all true that parents are less strict*.

Perceived peer influence/involvement consisted of two composite items. The first composite measured the extent to which the participant's friends were perceived to use substances. Participants were asked to indicate "How many of your friends do each of the following…," including using marijuana; using cocaine; "sniffing" or "huffing" glue, gas, and so forth (inhalants); using uppers; using downers; and getting drunk (rated on a 4-point scale from *none* to *all of them*). Participants indicated the extent to which their friends used

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each substance listed as a separate item. To create a composite of the extent to which friends are perceived to use substances, the mean of the six items was computed ($\alpha = .85$). The second composite item involved the extent to which the participant's friends ask the participant to use substances. Participants were asked to indicate "How often have your friends asked you to get drunk?" and "How often have your friends asked you to use…?" marijuana, cocaine, inhalants, uppers, and downers. Each drug was rated on a scale from 1 (*not at all*) to 4 (*very often*). To create a composite of the extent to which friends asked the participant to use drugs, a mean was computed across all six items ($\alpha = .81$). The Cronbach's alpha for the two composite items combined was .73.

Marijuana involvement consisted of three items ($\alpha = .81$), at item asking "How often in the last month have you used marijuana?" (rated on a scale from 1 = *none* to 6 = *several times every day*); an item asking participants to indicate their self-identification as a user of marijuana, from 1 (*non-user*) to 6 (*very heavy user*); and a dichotomous item indicating "Have you ever used marijuana when alone" (*yes* or *no*). All items (except for the dichotomous marijuana involvement item) were *z*-score transformed around group means to attenuate variance problems because of skewed distributions.

PROCEDURE

Surveys were conducted between the years 1996 and 2000. Notification of the survey was sent to parents two weeks prior to its administration. Parents were informed that if they did not wish their child to participate, they could sign the notice and return it to the school. In addition, at the time the survey was given, students were told that their participation was voluntary, and they could leave any or all questions blank. The surveys contained no identifying information, and the procedures used ensured complete confidentiality.

Prior to using the survey data for analyses, 40 different internal consistency checks were made on each completed survey. If there were three or more inconsistencies, the student's survey was discarded. In addition, surveys with missing data on key items included in this analysis were deleted. Schools were replaced only under the following conditions: A school had less than 80% of enrolled students taking the survey, or surveys from a school suggested evidence of poor administration.

RESULTS

MEAN DIFFERENCES IN PARENTAL MONITORING AND MARIJUANA INVOLVEMENT

To test for mean differences in self-reported levels of parental monitoring, the parental monitoring items were combined as a summed parental monitoring composite. A univariate between-*SS* ANOVA was conducted on average parental monitoring total scores. There was a main effect for ethnicity, $F(2, 7{,}497) = 6.158$, $p < .001$, $\eta^2 = .00$. As predicted, Bonferroni follow-up tests indicated that this effect was because of a higher parental monitoring mean (i.e., less endorsement of items worded to indicate lack of parental monitoring) among African American participants ($M = 11.82$, $SD = 3.34$) compared to non-Hispanic White ($M = 11.51$, $SD = 3.14$) and Mexican American participants ($M = 11.59$, $SD = 3.32$).

For total marijuana involvement scores, a between-*Ss* ANOVA indicated significant differences, $F(2, 7{,}497) = 22.78$, $p < .001$, $\eta^2 = .01$. Follow-up tests indicated that

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non-Hispanic White participants reported the highest marijuana use ($M = 4.60$, $SD = 2.99$), followed by Mexican American ($M = 4.32$, $SD = 2.59$) and African American ($M = 4.09$, $SD = 2.36$) participants. As expected, African American participants showed lower marijuana involvement rates compared to other ethnic groups.

MEASUREMENT MODEL

Confirmatory factor analysis, conducted using EQS (Bentler, 1995) with maximum likelihood estimation of the covariance matrix was used to test the measurement model for each ethnicity (Mexican American, African American, and non-Hispanic White). The measurement model was a three-factor model specified such that the four parental monitoring items represented the first factor, the two peer influence/involvement items represented the second factor, and the three marijuana involvement items represented the third factor (see Table 1 for means, standard deviations, factor loadings, and residuals for individual variables for each ethnicity; see Table 2 for factor intercorrelations). Although the Satorra-Bentler scaled chi-square for the measurement model reached statistical significance for each ethnicity, other fit indices indicated that the model fit adequately for each (see Table 3).

Tests of measurement invariance across ethnicity were conducted. An unconstrained model was run first with no equality constraints for factor loadings imposed. This was followed by a partially constrained model in which all factor loadings were declared to be equal. This is consistent with Van de Vijver and Leung's (2001) suggestion that because factor loadings represent the "heart of the model" (p. 1018), test of invariance among factor loadings is most central to testing cultural equivalence. The chi-square difference test between the two models was significant ($\chi^2 = 93.871$, $df = 18$, $p < .0005$), indicating that there were differences in factor loadings across ethnicity. Based on results obtained from the Lagrange multiplier test, 12 equality constraints were released before the chi-square difference test reached nonsignificance. Among the four parental monitoring indicators, the constraint for the third indicator (i.e., "My parents are less strict than most parents in letting me have fun with my friends,") was released between African American and non-Hispanic White students as well as between African American and Mexican American students. Thus, this item was invariant only between non-Hispanic White and Mexican American students, indicating that the extent to which parents are "less strict" among African Americans does not necessarily have the same meaning or representativeness for the overall construct of parental monitoring as defined in psychometric space by the other items. For the fourth parental monitoring indicator, the equality constraint was released for African American and Mexican American as well as between non-Hispanic White and Mexican American students. Thus, invariance for this item was only demonstrated between African American and non-Hispanic White students. For peer influence, the equality constraint was released for the second indicator for African American versus both non-Hispanic White and Mexican American students, thus reaching invariance only between non-Hispanic White and Mexican American students. Among the three marijuana involvement indicators, equality constraints were released for the first indicator between African American and non-Hispanic White, as well as between non-Hispanic White and Mexican American students. Thus, invariance for this item was found only between African American and Mexican American students. Equality constraints for the second indicator of marijuana involvement were released between African American and non-Hispanic White students as well as between non-Hispanic White and Mexican American students, thereby achieving invariance only between African American and Mexican American students. Finally, for the third indicator of marijuana involvement, equality constraints were released between

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TABLE 1
Means, Standard Deviations, Standardized Factor Loadings, and Residuals for Individual Variables

Latent variables	*Mean*	*Standard Deviation*	*Factor Loading*	*Residual*
Mexican American				
Parental Monitoring				
1. Out as often as I want	0.31	0.68	.67	.74
2. Out without asking	0.33	0.45	.58	.81
3. Less strict	0.30	0.64	.64	.77
4. Out late as I want	0.37	0.46	.67	.75
Peer Influence/Involvement				
5. Peers do drugs	0.26	0.78	.66	.76
6. Peers ask	0.00	1.01	.74	.67
Marijuana Involvement				
7. Last month use	0.02	0.99	.86	.51
8. Type of user	0.00	1.00	.96	.28
9. Ever used when alone	1.18	0.39	.68	.73
African American				
Parental Monitoring				
1. Out as often as I want	0.32	0.67	.70	.73
2. Out without asking	0.31	0.46	.59	.81
3. Less strict	0.36	0.66	.58	.81
4. Out late as I want	0.36	0.40	.63	.78
Peer Influence/Involvement				
5. Peers do drugs	0.00	1.00	.53	.85
6. Peers ask	0.01	1.00	.65	.76
Marijuana Involvement				
7. Last month use	–0.00	0.99	.85	.52
8. Type of user	–0.04	1.01	.96	.29
9. Ever used when alone	1.15	0.35	.71	.70
Non-Hispanic White				
Parental Monitoring				
1. Out as often as I want	0.29	0.70	.64	.77
2. Out without asking	0.29	0.51	.55	.84
3. Less strict	0.32	0.65	.67	.74
4. Out late as I want	0.35	0.46	.60	.80
Peer Influence/Involvement				
5. Peers do drugs	0.25	0.79	.71	.70
6. Peers ask	–0.00	0.99	.82	.58
Marijuana Involvement				
7. Last month use	–0.02	1.01	.92	.40
8. Type of user	0.03	0.98	.97	.23
9. Ever used when alone	1.19	0.39	.72	.69

African American and non-Hispanic White students as well as between non-Hispanic White and Mexican American students, indicating invariance only between African American and Mexican American students. The presence of measurement variance indicates that equivalence has not been reached. However, because differences in chi-square can be affected by large sample sizes (Bentler & Bonett, 1980), we also tested factor loading invariance using differences in comparative fit index (CFI). Consistent with Cheung and Rensvold's (2002) guidelines, change in CFI greater than −.01 were considered to show lack of invariance. In contrast to the chi-square change test results, the change in CFI test indicated that there were no differences across ethnicities in measurement models. On

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TABLE 2
Latent Factor Intercorrelations

Construct	*1*	*2*	*3*
Mexican American			
1. Parental monitoring		—	
2. Peer influence/involvement	–.19		—
3. Marijuana involvement	–.13	.64	—
African American			
1. Parental monitoring		—	
2. Peer influence/involvement	–.29		—
3. Marijuana involvement	–.23	.64	—
Non-Hispanic White			
1. Parental monitoring		—	
2. Peer influence/involvement	–.13		—
3. Marijuana involvement	–.10	.72	—

TABLE 3
Chi-Square Statistics and Fit Indices

	χ^2	df	p	N	RMSEA	NNFI	CFI
Mexican American	170.26	24	<.001	2,500	.05	.97	.97
African American	137.74	24	<.001	2,500	.04	.98	.98
Non-Hispanic White	142.11	24	<.001	2,500	.05	.98	.98

NOTE: RMSEA = root mean square error of approximation; NNFI = non-normed fix index; CFI = comparative fit index. Because of the non-normal distributions of variables, the Satorra-Bentler scaled chi-square was used and the robust CFI.

the basis of this result, and for exploratory purposes, we proceeded with comparisons of structural models across groups. To test for the generalizability of these results, a set of analyses was also conducted among 7th-9th graders.[2]

STRUCTURAL MODELS

Structural models were first tested for each ethnicity individually. Structural equation modeling was conducted using EQS 5.7 (Bentler, 1995). Robust maximum likelihood estimation procedures were again used to account for non-normality. For non-Hispanic Whites, the Satorra-Bentler scaled chi-square was χ^2 (df = 25, N = 2,500) = 142.12, $p <$ .001. Although the chi-square was significant, the RMSEA (root mean square error of approximation) was .04, the NNFI (non-normed fix index) was .98, and the robust CFI was .98, and was thus judged to have good fit to the data (see Figure 1). For Mexican Americans, the Satorra-Bentler scaled chi-square was χ^2 (df = 25, N = 2,500) = 170.43, $p <$ .001. Although the chi-square was significant, the RMSEA was .05, the NNFI was .97, and the robust CFI was .98, and was thus judged to have good fit to the data (see Figure 2). For African Americans, the Satorra-Bentler scaled chi-square was χ^2 (df = 25, N = 2,500) = 140.02, $p <$ .001. Although the chi-square was significant, the RMSEA was .04, the NNFI was .97, and the robust CFI was .98, and was thus judged to have good fit to the data (see Figure 3).

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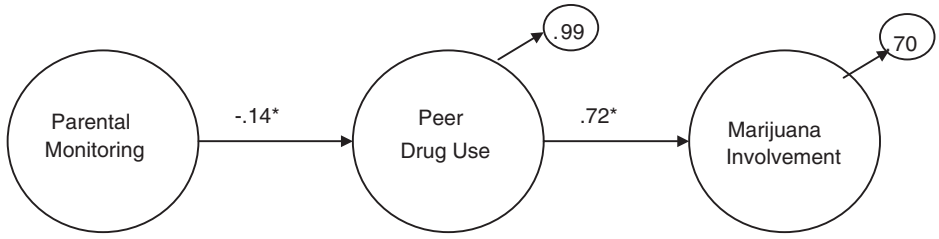

Figure 1: Standardized structural path values and disturbance terms for non-Hispanic Whites.

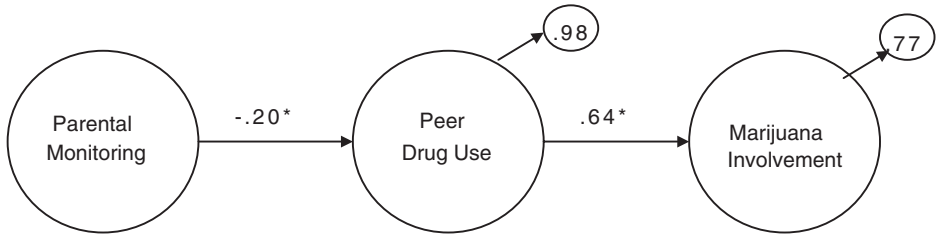

Figure 2: Standardized structural path values and disturbance terms for Mexican Americans.

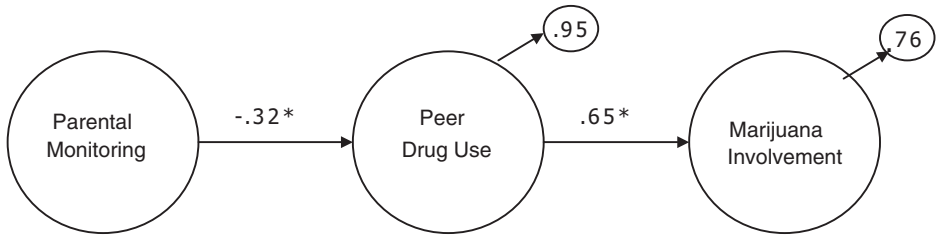

Figure 3: Standardized structural path values and disturbance terms for African Americans.

Multiple group comparisons were conducted among ethnicities, with factor-loading constraints of equality released for indicators according to chi-square difference test results for measurement models. Error terms were not correlated among any of the variables. The model fit equally well between Mexican Americans and non-Hispanic Whites, ($\chi^2 = 5.483$, $df = 2$, $p = .06$). For Mexican Americans compared to African Americans and for African Americans compared to non-Hispanic Whites, the model only reached equivalence after releasing the constraint on the path between parental monitoring and peer influence ($\chi^2 = 1.425$, $df = 1$, $p = .23$ and χ^2 difference = 2.072, $df = 1$, $p = .15$, respectively). To supplement this analysis with a method that was resistant to the effects of sample size, we also looked at the difference in standardized factor loadings for each pair of constrained items. We decided that those differences greater than .10 were large enough to be considered not reaching equivalence across groups. Between Mexican Americans and African

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Americans, the absolute value of the difference in this path was .12, indicating a meaningful difference. Between African Americans and non-Hispanic Whites, the absolute value of the difference in this path was .18, also indicating a significant difference. It was therefore noted that parental monitoring was a better predictor of peer influence for both Mexican American and African American 10th-12th graders compared to non-Hispanic White 10th-12th graders in this sample.

TESTS OF BIAS USING THE ANOVA PROCEDURE

Because the previous analyses for measurement invariance showed mixed results for factor invariance, ANOVA procedures were used as a means of identifying differential item functioning among those items that did show some evidence of invariance to further explore potential bias in the present measures. We felt that this additional information could provide clues as to ways that items may be biased. The ANOVA procedure as outlined by Van de Vijver and Leung (1997) was used. This involved computing each participant's total score for each construct, and then using this total score to divide participants into nine groups (with approximately equal numbers of participants in each group) according to the magnitude of their total score. This grouping variable, "score level," was then used along with ethnicity in ANOVA procedures to determine differential item functioning (with average response to each item within the construct as dependent variables). Van de Vijver and Leung (1997) use the term nonuniform bias to refer to the situation where the nature of the bias is not consistent across score levels, such as when one culture is higher than the other at one score level and lower at another. The term uniform bias refers to when one culture consistently scores higher than the other (on average) at each score level. No bias is said to exist when there are no significant differences in average responses by culture for each score level (Van de Vijver & Leung, 1997). Thus, ANOVA results and graphical depictions are used to determine whether each item showed no bias (no main effect for culture and no interaction of culture and score level), uniform bias (main effect for culture only), nonuniform bias (interaction of culture and score level), or both uniform and nonuniform bias. Raw scores rather than *z*-scores were used for the present analyses. Differential item functioning analyses could not be conducted for the dichotomous marijuana involvement item, because graphical representation using average item responses (rather than probabilities) is the focus of the present method.

For the parental monitoring item "My parents allow me to go out as often as I want," there was a main effect for ethnicity, $F(2, 6{,}371) = 23.754$, $MSE = .284$, $p < .001$, $\eta^2 = .01$ as well as a significant ethnicity by score level interaction, $F(16, 6{,}371) = 6.294$, $MSE = .284$, $p < .001$, $\eta^2 = .02$. Although the effect size for the interaction was small, the presence of an interaction indicates that the bias may not necessarily be consistent across score levels, therefore indicating the possibility of nonuniform bias. Because three ethnic groups were used in the present study, we referred to the graph (see Figure 4) to determine specific patterns of bias for each ethnicity. As Figure 4 shows, there is evidence of both uniform and nonuniform bias. African American participants appear to show higher responses (indicating less agreement) on average to midpoints of the scale compared to Mexican American and non-Hispanic White participants at the same score level. In other words, among youth whose parental monitoring was neither especially permissive nor vigilant, African American youth were less likely to report that their parents allow them to go out as often as they want (given that a rating of 4 indicates *not at all true)*. Therefore, the extent to which youth have control of the frequency of going out may be differentially representative

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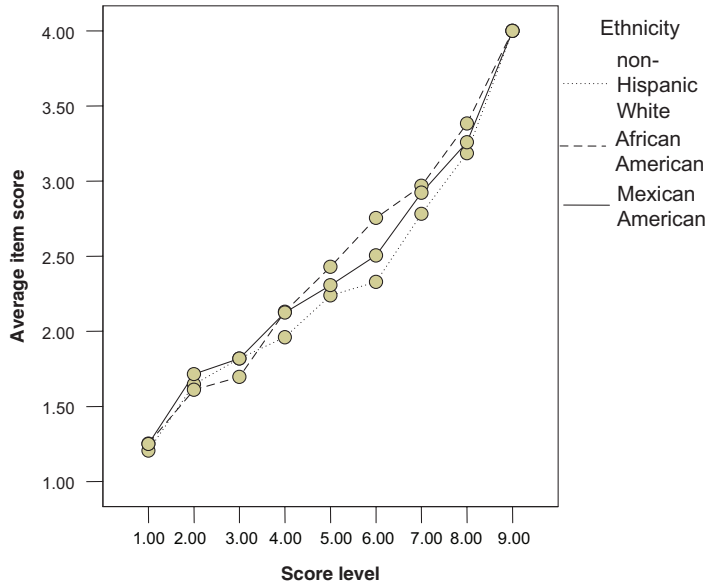

Figure 4: Average scores for each ethnicity and score level for first parental monitoring item, "My parents allow me to go out as often as I want."

of the monitoring practices among African American and Mexican American or non-Hispanic White youth. Thus, use of the ANOVA procedure enabled the identification of possible sources of bias for this item, which had not been identified using the test of measurement invariance in SEM. It also was suggestive of the nature of the bias, indicating that mid-range scores were the most likely to be answered differently by score level for each cultural group. This is consistent with Byrne and Watkins' (2003) finding that the ANOVA procedure allows tests of item bias that might be more sensitive and specific than the tests of factorial invariance in SEM.

For the parental monitoring item "My parents let me go any place I want without asking," there was not evidence of bias. Neither the main effect for culture nor the culture by score level interaction was significant, and the graph (see Figure 5) shows relatively consistent overlap among the three groups. Therefore, this is evidence that among all of these ethnic groups, whether youth must ask their parents before going to a particular place is a consistent indicator of the degree of parental monitoring.

For the parental monitoring item "My parents are less strict than most parents in letting me have fun with my friends," there was a main effect for culture, $F(2, 6{,}371) = 33.086$, mean squared error (*MSE)* = .410, $p < .001$, $\eta^2 = .01$, as well as a culture by score level interaction, $F(16, 6{,}398) = 6.193$, $MSE = .410$, $p < .001$, $\eta^2 = .02$, suggesting both uniform and nonuniform bias. The graph (see Figure 6) indicated that this bias may exist for lower as well as mid-range levels of monitoring. At the lowest values of parental monitoring (*x*-axis), Figure 6 shows that compared to African American and Mexican American youth, non-Hispanic White youth with the lowest monitoring scores are highly likely to endorse this statement with a score of 1 (indicating *very true)*. However, at mid-range monitoring score levels, African American youth are more likely to endorse that their parents are less strict than most, compared to Mexican American and non-Hispanic White youth with the

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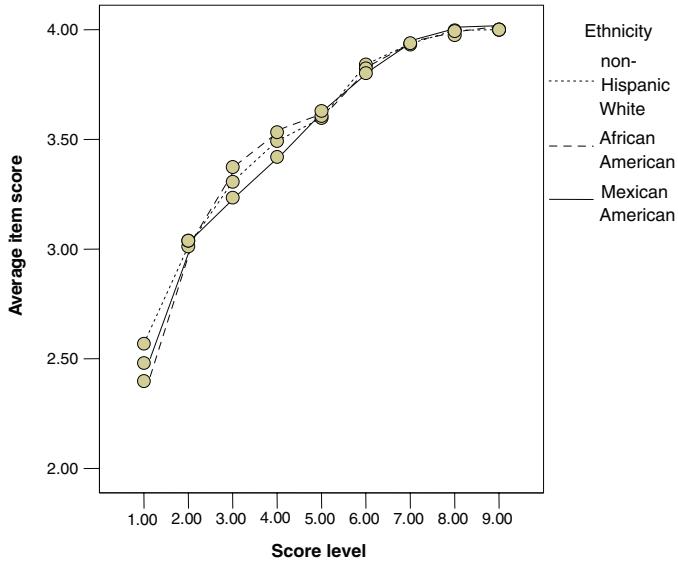

Figure 5: Average scores for each ethnicity and score level for second parental monitoring item, "My parents let me go any place I want without asking."

same monitoring scores. These findings are similar to the SEM results, although there are some additional points of interest.

Although the SEM results indicated that there was invariance across non-Hispanic White and Mexican American groups, the ANOVA results were able to identify that one source of invariance in the measurement of parental monitoring may be because of cultural differences in perceptions or beliefs about strictness or the behaviors that determine whether a parent is perceived as being strict. This is illustrated by examining sources of invariance for the first and third parental monitoring items for the mid-range parental monitoring scores. For African American youth with mid-range parental monitoring scores, Figure 4 illustrates that these individuals are more likely to report that their parents do not let them go out as often as they want; however, Figure 6 shows that these same participants are more likely to perceive their parents as being *less* strict compared to other parents.

For the parental monitoring item "My parents let me stay out as late as I want to," there was a main effect for ethnicity, $F(2, 6{,}371) = 30.314$, $MSE = .248$, $p < .001$, $\eta^2 = .01$, as well as an ethnicity by score level interaction, $F(16, 6{,}371) = 3.677$, $MSE = .248$, $p < .001$, $\eta^2 = .01$, indicating both uniform and nonuniform bias. As shown in the graph (see Figure 7), the bias primarily occurs at the middle of the scale, with Mexican American participants scoring lower (indicating higher agreement) compared to non-Hispanic White participants and in particular compared to African American participants. Thus, staying out late has a different meaning for parental monitoring among Mexican American youth compared to non-Hispanic White and particularly African American youth.

For the peer influence composite "How many of your friends do each of the following…," there was a main effect for ethnicity, $F(2, 4{,}761) = 34.348$, $MSE = .891$, $p < .001$, $\eta^2 = .01$, as well as an ethnicity by score level interaction, $F(16, 4{,}761) = 8.613$, $MSE = .891$, $p < .001$, $\eta^2 = .03$. The graph (see Figure 8) indicates that for this item, Mexican American participants with higher total score levels scored higher on average than participants from the other two

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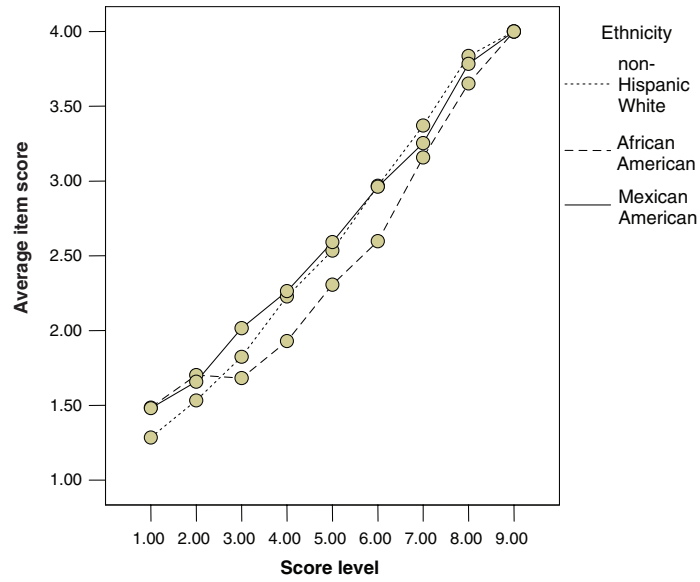

Figure 6: Average scores for each ethnicity and score level for third parental monitoring item, "My parents are less strict than most parents in letting me have fun with my friends."

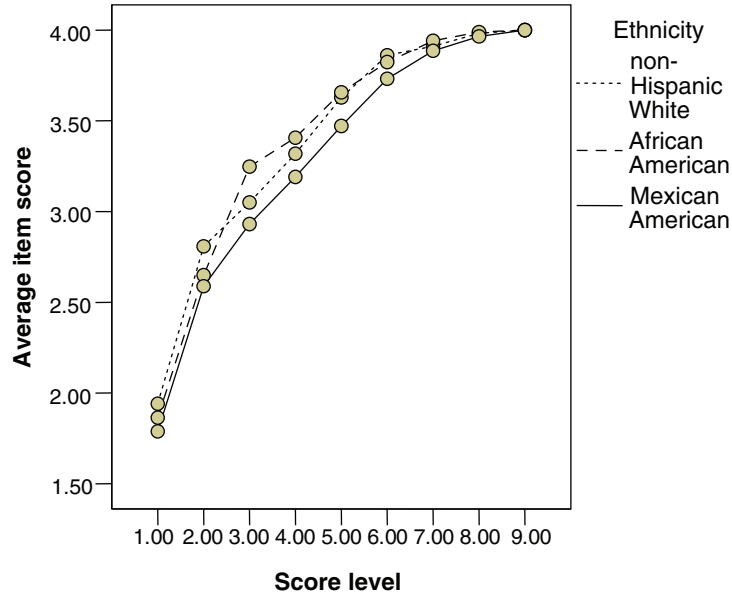

Figure 7: Average scores for each ethnicity and score level for fourth parental monitoring item, "My parents let me stay out as late as I want to."

groups with the same total score levels. This diverges from the SEM findings, which did not indicate invariance for this item. Furthermore, it shows that this item may be particularly susceptible to bias, given the larger effect size of the ethnicity by score

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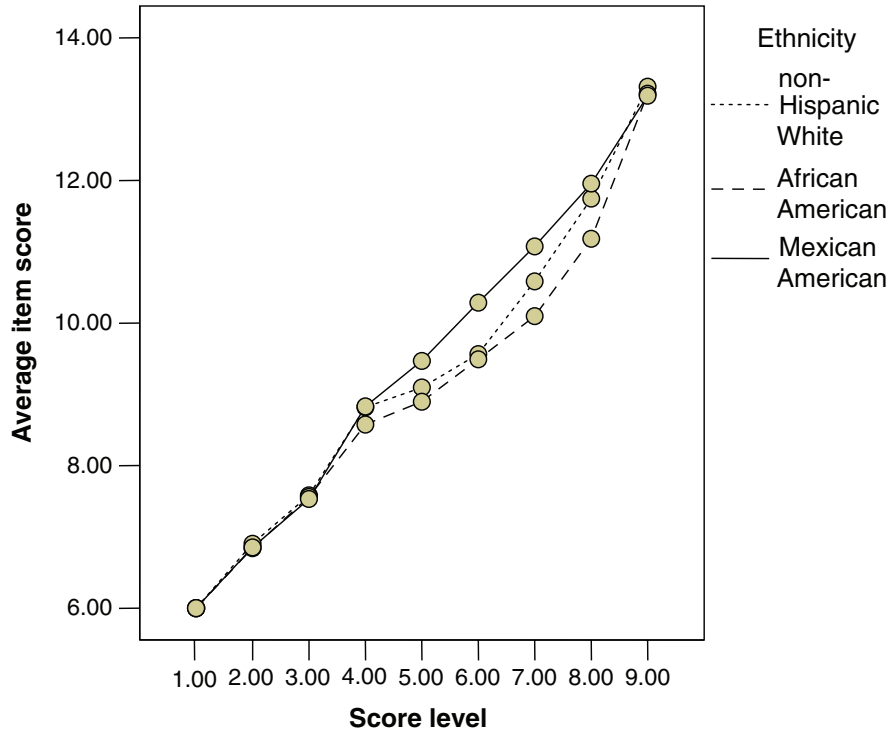

Figure 8: Average scores for each ethnicity and score level for first peer influence item, "How many of your friends do…."

level interaction. This may indicate that peer influence among Mexican American youth is more likely to be expressed in the form of passive peer influence, such as observing other peers engage in the behavior, compared to how peer influence is expressed among the other ethnic groups.

For the peer influence composite "How often have your friends asked you to use…," there was a main effect for ethnicity, $F(2, 4{,}761) = 34.348$, $MSE = .891$, $p < .001$, $\eta^2 = .01$, as well as an ethnicity by score level interaction, $F(16, 4{,}761) = 8.613$, $MSE = .891$, $p < .001$, $\eta^2 = .03$. However, the graph (Figure 9) for this item indicates that Mexican Americans scored lower on some points of the scale on average compared to the other two ethnicities, whereas African Americans tended to score slightly higher. This item may also be more susceptible to item bias, given the larger effect interaction effect size compared to parental monitoring items. This suggests that Mexican American youth at moderate levels of overall peer influence are less likely to experience peer influence in the form of direct offers than African American and non-Hispanic White youth experiencing similar levels of overall peer influence.

For the marijuana use item, "How often in the last month have you used marijuana?" there was a significant ethnicity by marijuana score level interaction, $F(22, 7{,}464) = 4.303$, $p < .001$, $\eta^2 = .01$. Although the effect size and graphical representation (see Figure 10) for this interaction indicate that these differences may be unimportant, possible sources of bias would exist in the higher range of responses to this item, possibly because of differential

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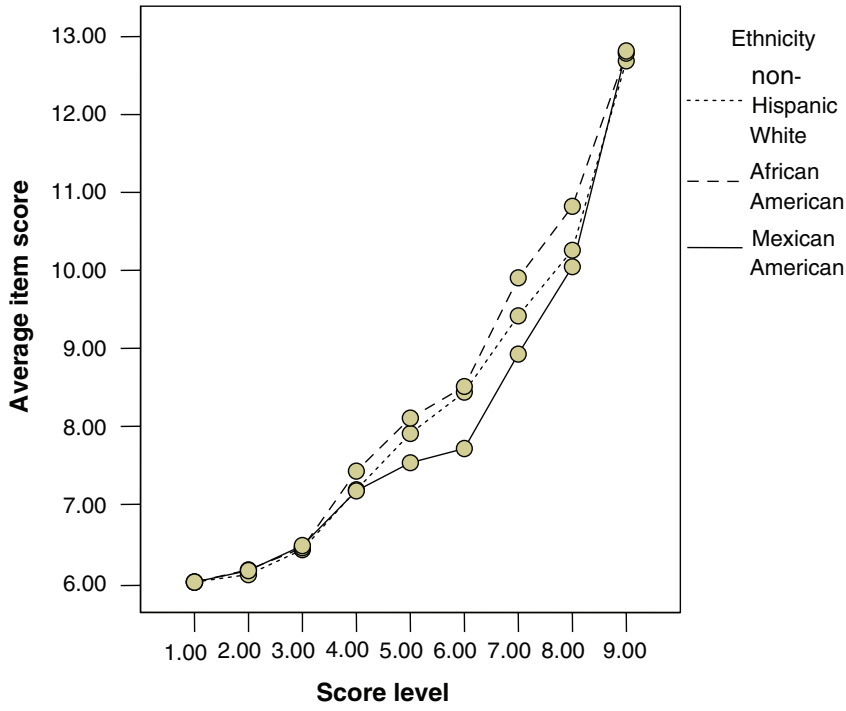

Figure 9: Average scores for each ethnicity and score level for second peer influence item, "How often have your friends asked you to use…"

under- or overreporting among the three groups. Thus, although these differences are largely trivial, one possible source of bias may be the extent to which youth from different cultures feel comfortable reporting use of illegal substances in survey research.

For the marijuana use item asking participants to indicate their self-identification as a user of marijuana, there was a significant ethnicity by score level interaction, $F(22, 7{,}464) = 4.619$, $p < .001$, $\eta^2 = .01$. The graph for this item (see Figure 11) indicates that there are potential differences in responses between Mexican American and the other two ethnicities at higher ends of the scale for this item. Comparing the graphs for these two marijuana use items illustrates where Mexican American participants may be responding differently from African American or non-Hispanic White participants of the same score level. Specifically, among those with high score levels of marijuana use, Mexican American youth are less likely to label themselves as "heavy" users than non-Hispanic White or African American youth. This indicates that when proposing to compare rates of substance use across cultural groups, more objective measures (e.g., self-reports of specific behaviors) may be less susceptible to bias than more global self-assessments of a youth's self-label in terms of overall levels of use. However, the bias among drug use measures was minimal and less pronounced than measures of social influence and parenting variables.

For the dichotomous item indicating "Have you ever used marijuana when alone?" (*yes* or *no*), logistic regression Wald test results indicated a significant effect for ethnicity, (2,1)8.45, $p = .02$, and a significant ethnicity by marijuana score level interaction (2,1)11.08, $p = .004$. However, no graph could be produced because interpretation using

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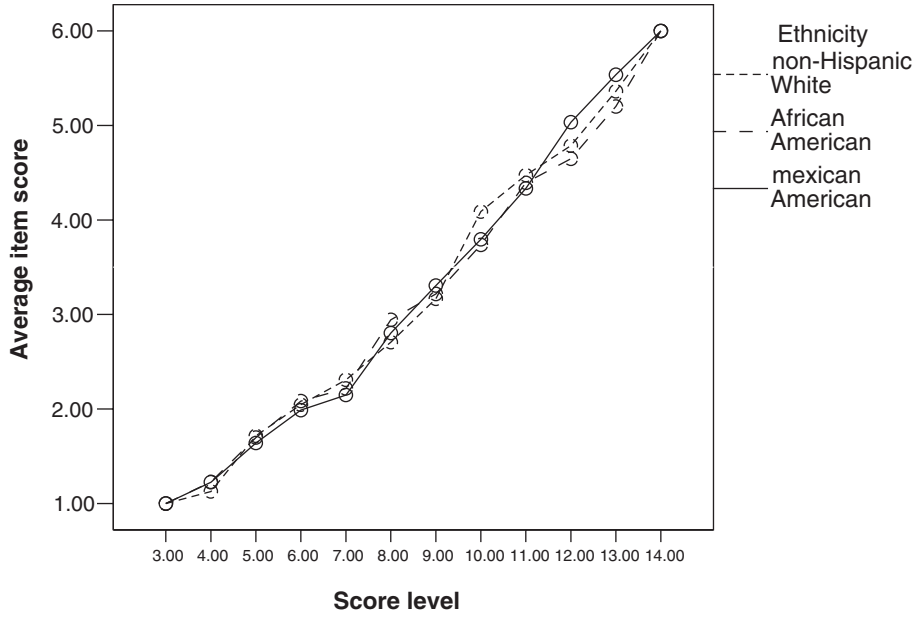

Figure 10: **Average scores for each ethnicity and score level for first marijuana involvement item, "How often in the last month have you used marijuana?"**

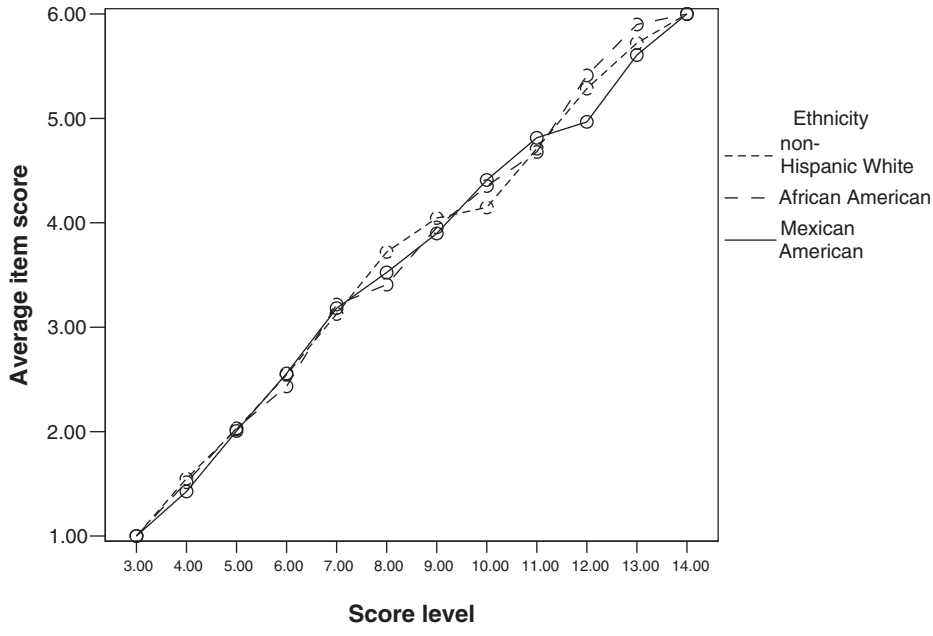

Figure 11: **Average scores for each ethnicity and score level for second marijuana involvement item (self-identified type of user).**

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the present method requires average responses on the dependent variable. An implication of this finding is that it may be an interesting source of cultural variance in the meaning of solitary drug use across cultures.

Although the SEM results may reflect some of these differences, Van de Vijver and Leung's (1997) procedure was able to point to more discrete sources of bias. Specifically, although our SEM tests of factorial invariance addressed differences in how items load on their respective latent factors (which may or may not be accounted for by differential item responding), ANOVA tests of item bias address differences in how individuals from different cultural groups respond to specific items and variability in group patterns across the points on each item's scale of measurement to identify how items differ across cultural groups in their ability to identify high- and low-scoring individuals for a particular construct.

DISCUSSION

CULTURAL DIFFERENCES IN PREDICTORS OF DRUG USE

Consistent with previous research (Barnes, Farrell, & Banerjee, 1994; Beck et al., 1999; Catalano et al., 1993; Gillmore et al., 1990; Guo et al., 2002), African American participants showed lower marijuana use rates. Furthermore, the rates of parental monitoring were higher among African American youth. This is consistent with research showing higher levels of parental control (Giordano et al., 1993) and proactive family management practices (Catalano et al., 1992, 1993) among African American families, although these findings have been inconsistent (see Peterson et al., 1994; see also Fridrich & Flannery, 1995). Nonetheless, our finding is consistent with Wallace's (1999) proposal that African American parents may be more diligent in their parental monitoring practices, which is thereby reflected in the lower initiation and drug use rates among African American youth. This is an important finding because it illustrates a strength of African American families and an area for future research.

It was also found that parental monitoring was a better predictor of peer influence for both African American and Mexican American 10th-12th graders than for non-Hispanic White 10th-12th graders in the present study. Although there is previous research on the relation between parental monitoring and drug use across ethnicities, these studies have produced mixed results (see Guo et al., 2002; Beck et al., 1999; Rosay et al., 2000). However, this is the first known study to directly test for differences in the relation between parental monitoring and peer influence among these ethnicities. Our results indicate that in addition to higher overall levels of parental monitoring behaviors among African American parents, the behaviors and monitoring practices themselves have a stronger relation with the risk factor of peer influence on drug use among African American youth (independent of the higher mean level of monitoring) as well as Mexican American youth. Although this study is cross-sectional and therefore cannot attest to directionality of these effects, theories around drug use prevention (see Oetting & Donnermeyer, 1998) and previous prospective research (Cleveland et al., 2005; Dishion et al., 1995) indicate that it is reasonable to assume that this may be a directional effect whereby parental monitoring can protect against deviant peer associations/peer influence. Thus, we concluded that parental monitoring has more influence among African American youth. This suggests that there are additional factors operating among these cultural groups that need to be identified to understand this differential effectiveness of parental monitoring in its association with the extent to which youth are exposed to peer influences to use drugs. Therefore, this represents an informative area for future

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research in prevention as well as in understanding cultural differences in family monitoring and socialization practices. First, designs that enable tests of prospective effects while controlling for baseline levels and cross-sectional relations among variables, are needed to test whether this differential relation holds for prospective effects. Second, cultural variables that may account for this differential relation need to be identified and modeled. For example, an emphasis during socialization on interdependence and family values among these cultures may lead parental practices and values to have more influence on risk factors for substance use among African American and Mexican American youth (see Zayas & Solari, 1994). This is consistent with evidence that African American values emphasizing following parental rules (Beech & Scarinci, 2003) and the importance of how one is viewed by parents (Kegler et al., 2002) serve as protective factors against smoking, even into adulthood. However, it is also possible that this differential relation is because of differences in equivalence in the constructs across groups.

EQUIVALENCE ISSUES ACROSS CULTURAL GROUPS

The present results may require cautious interpretation because of statistical evidence of potential problems with equivalence in measures across these cultural groups. Although change in CFI did not meet Cheung and Rensvold's criterion (2002) for a meaningful statistical difference in measurement across groups, this evidence of invariance may not be sufficient in the context of the present analyses. Given the fact that we are testing the most liberal form of invariance (using only constrained factor loadings, rather than constrained errors or variances), using a subthreshold difference in CFI may arguably be insufficient to justify the conclusion of measurement invariance, especially in light of other evidence of bias. Specifically, we found evidence that parental monitoring, peer influence, and marijuana involvement were measured differently across African American, non-Hispanic White, and Mexican American 10th-12th graders. Van de Vijver and Leung's (1997) ANOVA approach was able to highlight specific bias for each item, and identify bias that was not discovered using the SEM technique. This is consistent with previous research showing that the ANOVA procedure is a more sensitive test of item bias (Byrne & Watkins, 2003), and suggests that item invariance may be important in the present analyses.

On the other hand, the present analyses showed that the magnitude of differences in measurement was not large. Although it may be that these differences are largely trivial in the statistical sense, we disagree that they are trivial in a practical sense. We feel that these may be important warning signs that latent constructs may not be being measured adequately or equivalently across groups, especially given the consistency of these findings across age groups in other analyses (see Note 2), the small number of items typically used to measure such constructs (as in the present study), and the evidence from previous research of cultural differences in related constructs, such as parental control and discipline practices and their relation to outcomes such as depression and externalizing behavior, respectively (Finkelstein, Donenberg, & Martinovich, 2001; Deater-Deckard, Dodge, Bates, & Pettit, 1996). Although there are techniques available that can account for measurement invariance to compare constructs across groups (i.e., using item response theory; Reise, Ainsworth, & Haviland, 2005), even these procedures require at least a subset of invariant items to develop comparable scales of measurement. Furthermore, the evidence for lack of invariance at the factor structure level suggests that bias may be present at the level of construct domain representation. This evidence that the individual items used are not measuring the latent construct of interest in the same manner and are not responded to

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consistently across individuals at the same level of the construct makes it highly likely that the constructs themselves require more or different items for adequate measurement across cultural groups. This problem cannot be ameliorated with the use of statistics, because it requires identifying the meaning of these constructs within a group and constructing one's measures accordingly. Therefore, these results may be merely the tip of the iceberg in terms of identifying inequivalence of these constructs, because inequivalence may occur that cannot be identified with statistical methods.

Based on these results, investigators should consider the possibility that measurement invariance resulting from construct, method, or item bias may contribute to previous findings of differences across ethnicity in risk and outcome variables associated with adolescent substance use (Gottfredson & Koper, 1997). As shown in the present study, this is true even when considering cultural differences among those who reside in the United States and who may have adopted many elements of the U.S. culture and language. To date, often differences in mean levels or relationships between variables across ethnic groups are interpreted without first examining whether the measurement of these variables is equivalent across ethnicity (see Gottfredson & Koper, 1997), which can lead to overinterpretation and findings that may not be warranted, and may be the root of conflicting findings in the literature. Therefore, these results are important for interpretation of previous research in this area. Second, these results are important to inform future cross-cultural prevention research. They raise awareness that equivalence issues are relevant to these variables, and as Malpass and Poortinga (1986) point out, in applied research, it is important for researchers to know to what extent lack of equivalence is likely. The present study adds such knowledge.

Several forms of equivalence need to be considered before claims can be made for differences in relationships or levels between variables across ethnicity. First, measurement equivalence, the type considered in this article, is important for accurate interpretation of statistical results. Measurement equivalence is established when the psychometric structures of variables being measured are consistent across groups (Berry, 1980). If variables are measured differently across groups, comparing the magnitude of scores on variables across groups is premature and inappropriate. This also holds for relationships between variables. To use the well-known saying as an analogy, there is no point in comparing whether oranges are related to grapes among African Americans the same way that apples are related to grapes among non-Hispanic Whites.

In addition to statistical accuracy, a second reason to assess measurement differences is that otherwise meaningful differences in cultural practices or concepts are overlooked. The aforementioned problems with measurement nonequivalence are important because they may indicate a lack of functional and conceptual equivalence as well, thus indicating the presence of bias (Beauvais & Trimble, 1992). Functional equivalence means that behaviors serve the same purposes in different cultural groups (Berry, 1980). In the present research, it is possible that the lack of invariance between Mexican Americans and the other two ethnic groups for the item "My parents let me stay out as late as I want to" is because of issues of functional equivalence. It may be that although for most parents monitoring how late a child stays out at night is central to the larger role of parental monitoring, this behavior may not serve this purpose similarly among Mexican American families, therefore suggesting construct bias. The lack of measurement invariance in the current study may also indicate lack of conceptual equivalence. Conceptual equivalence is achieved when the behavior or item on the questionnaire is given the same meaning across cultural groups (Berry, 1980). In the present study, lack of invariance in factor loadings for items such as "My parents are less strict than most parents in letting me have fun with my

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friends" may be because of different meanings of "strict" or "fun with friends" among African American students, therefore suggesting item bias. Finally, depending on participants' interpretations of the response scale anchors, the nature of the administration, the perceived expectations of survey administrators, and so forth, method bias may also have been present.

Therefore, based on the present results, we conclude that there is evidence for cross-cultural differences in the influence and expression of important prevention-related variables of parental monitoring, peer influence, and possibly drug use. First, we found that despite high levels of parental monitoring behaviors, African American youth were more likely to report that their parents were less strict than most parents in letting them have fun with their friends. This raises interesting questions regarding normative parental monitoring practices among African American families, as well as what determines perceptions of strict monitoring practices among African American youth. Although many African American youth may have parents who are engaging in the behaviors that constitute high parental monitoring in the context of preventing drug use and associating with deviant peers, these behaviors may not be the same behaviors as those that would lead the youth to perceive their parents as especially "strict" monitors their cultural group or social network. This is consistent with previous research and discussion regarding equivalence in *practice* and *style* in the measurement of parenting characteristics across cultural groups (Stewart & Bond, 2002). Stewart and Bond (2002) emphasize that specific parental behaviors (i.e., practices) can have different meanings for a parent's perceived style across cultural groups. This may also apply to the meaning of parental monitoring practices among African American versus non-Hispanic White youth in U.S. culture. The present findings add to this literature by showing that specific monitoring behaviors may be differentially related to perceptions of strictness. The findings indicate that future research should address questions of equivalence in practices and parental monitoring style among African American and non-Hispanic White cultural groups.

Second, we also found evidence for cultural variability in monitoring behaviors among Mexican American (compared to African American or non-Hispanic White) youth. Mexican American youth whose parents were highly involved in monitoring their children's behaviors and peer group interactions may not necessarily be as concerned about whether or not the youth stay out late. This may indicate that staying out late does not have the same meaning in Mexican American cultural groups and social networks, but more importantly, it suggests that there may be cultural variability in monitoring among Mexican American families that deserves recognition in future research. Emic (within-culture) studies of parental monitoring among Mexican American youth may identify broader aspects of cultural variability in monitoring behaviors and therefore requires future research.

Third, Mexican American youth differed from African American and non-Hispanic White youth in their ratings of peer influence variables, although African American and non-Hispanic White ratings were more similar. Specifically, the figures produced by the ANOVA technique together indicated that peer influence among Mexican American youth with moderate levels of overall peer influence may be primarily in the form of passive peer influence (i.e., friends using drugs) and may be less likely to be in the form of active peer influence (i.e., friends directly offering drugs) compared to non-Hispanic White and African American students. This is consistent with previous research on teaching behaviors among mothers across cultural groups, which indicates that Hispanic mothers are more likely to use modeling and visual cues, compared to non-Hispanic White mothers, who are more likely to use verbal techniques (see Zayas & Solari, 1994 for review). From

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a theoretical perspective, this is an important finding because it may illustrate a way that social influence differs among Mexican Americans (and possibly interdependent cultural groups more generally) compared to other cultural groups. From an applied/prevention perspective, this indicates that interventions targeted at peer influence may require sensitivity to cultural factors.

Fourth, although evidence of bias in drug use variables was not strong, future research might benefit from examining cultural differences in potential over- or underreporting among youth who are at high levels of use (i.e., method bias), what leads to youth self-perceptions of "type of user," and potential differences in the meaning or relative frequencies of drug use when alone across individuals with the same reported overall level of use. Method bias may be especially important to address if it tends to occur among those who are using drugs at higher rates, and are thereby at higher risk and are important targets for prevention or intervention efforts.

In sum, the present study identified differences in rates of drug use across ethnic groups, as well as differences in rates of parental monitoring behaviors and the extent to which these behaviors are effective at preventing associations with deviant peers that are highly associated with drug use. These differences should be considered in the context of potential measurement inequivalence, which was valuable in identifying possible cultural differences in the meaning of parental monitoring and the nature of peer influence. Future research is needed to explore the strengths of African American families that prevent drug use and differences in how important family and peer variables operate in preventing drug use across cultural groups.

NOTES

1. This survey is derived from The American Drug and Alcohol Survey and The Prevention Planning Survey, which are the copyrighted property of Rocky Mountain Behavioral Science Institute, Inc. (1-800-447-6354; www.rmbsi.com). This research project was granted permission to use and modify the survey through a special agreement between the institute and Colorado State University.

2. A test of multigroup model fit among a separate sample of 7th-9th graders using the same items produced a significant difference in chi-squares ($\chi^2 = 412.439$, $df = 18$, $p < .0005$). Seventeen constraints were released before the chi-square difference test failed to reach significance. Among the four parental monitoring items, constraints for the second indicator were released across all three groups. For the third and fourth indicators, constraints were released for African Americans versus both non-Hispanic Whites and Mexican Americans. For the first indicator for peer influence, constraints were released for African Americans versus both non-Hispanic Whites and Mexican Americans. The constraints for the second indicator for peer influence were released across all three groups. The constraint for the first indicator of marijuana involvement was released between African Americans and Mexican Americans. The constraint for the second indicator for marijuana involvement was released between African Americans and Mexican Americans as well as between non-Hispanic Whites and Mexican Americans. For the third marijuana involvement item, constraints were released between African Americans and Mexican Americans as well as between non-Hispanic Whites and Mexican Americans. In other words, none of the peer influence or marijuana involvement indicators reached invariance across all three groups, and only one parental monitoring item's factor loading reached invariance across all three groups.

Because differences in chi-square can be affected by large sample sizes (Bentler & Bonett, 1980), we also tested differences in CFI to determine the extent to which there were important differences in measurement of the constructs across ethnicities. Consistent with Cheung and Rensvold's (2002) guidelines, change in CFI greater than –.01 were considered to show lack of invariance. Using this criterion, it was found that a number of indicators showed lack of measurement invariance. These were the second parental monitoring item's factor loading (differing between African Americans and non-Hispanic Whites as well as between non-Hispanic Whites and Mexican Americans), the second peer influence indicator (with differences between African Americans and both non-Hispanic Whites and Mexican Americans), and the third marijuana involvement indicator (with differences

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between African Americans and Mexican Americans as well as between non-Hispanic Whites and Mexican Americans). These results provide supplementary evidence that the measurement invariance among 10th-12th graders may not necessarily be trivial and may in fact be symptomatic of a deeper measurement equivalence issue.

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