

BRIEF REPORT

Testing Measurement Invariance of the UPPS-P Impulsive Behavior Scale in Hispanic/Latino and Non-Hispanic/Latino College Students

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The National Institutes of Health's (NIH) *PhenX* Toolkit has recognized the UPPS-P Impulsive Behavior Scale as a recommended measure of impulsive dispositions, as this framework for impulsivity-like traits has demonstrated strong psychometric properties across a variety of samples and exhibited measurement and structural invariance across males and females. Impulsivity-like facets, as assessed by this measure, have also demonstrated robust relations to alcohol and substance use. However, racial and ethnic differences in impulsivity have largely been neglected in the literature. Thus, the current study sought to test measurement invariance on the UPPS-P across Hispanic/Latino and non-Hispanic/Latino college students and determine whether ethnicity moderates the relations between impulsivity-like facets and alcohol and other substance use endorsement. Results indicated that the UPPS-P is invariant between groups in this sample, which suggests that scale scores on this measure can be reliably compared across Hispanic/Latino and non-Hispanic/Latino individuals. There were no significant differences in impulsivity-like facets across groups; however, non-Hispanic/Latino individuals who were higher in sensation seeking exhibited increased log-odds of endorsing past-month smokeless tobacco use. Finally, impulsivity-like facets were significantly and differentially related to substance use outcomes, which support findings from previous studies. This research highlights the importance of examining impulsivity-like traits and substance use among Hispanic/Latino individuals, and provides evidence that the UPPS-P can be reliably and validly interpreted when testing differences between Hispanic/Latino and non-Hispanic/Latino groups.

Public Significance Statement

The present study provides evidence that impulsivity-like facets, as assessed by the UPPS-P Impulsive Behavior Scale, can be reliably and validly interpreted across Hispanic/Latino and non-Hispanic/Latino individuals. In addition, it highlights the importance of invariance testing and multicultural research.

Keywords: substance use, impulsivity, Hispanic/Latino, measurement invariance

The assessment of “impulsivity” has been the focus of increased attention in the extant literature, as it is the most transdiagnostic symptom criterion in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. (*DSM-5*; American Psychiatric Association, 2013). However, impulsivity can be operationalized in various ways (e.g., acting without premeditation, sensation seeking [SS], risk-taking, adventuresomeness; see Evenden, 1999). In a recent critique of the current state of “impulsivity” research, Cyders (2015) highlighted that “impulsivity” constructs often reflect

different behavioral tendencies (e.g., Smith et al., 2007), and using the term *impulsivity* is, in fact, a misnomer that has “lead to inconsistencies across studies and a stalemate in the accumulation of scientific knowledge” (Cyders, 2015, p. 204).

In light of these issues, the National Institutes of Health's [NIH] *PhenX* Toolkit (Hamilton et al., 2011) has endorsed the UPPS-P Impulsive Behavior Scale (Lynam, Smith, Cyders, Fischer, & Whiteside, 2007) as the recommended self-report measure of impulsogenic traits, which is encompassed by five facets: (a) sensation seeking (SS), or the tendency to seek out new and thrilling experiences; (b) lack-of-planning (LPlan), or the tendency to act without thinking; (c) lack-of-perseverance (LPer), or the inability to remain focused on a task; (d) positive urgency (PU), or the tendency to act rashly when experiencing extremely positive emotion; and (e) negative urgency (NU), or the tendency to act rashly in response to extreme negative emotion. The overall scale, as well as its subscales, has demonstrated psychometric soundness in undergraduate and young adult populations (see Cyders et al.,

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2007), as well as clinical samples (see Cyders, 2013, for a review). In addition, among an undergraduate sample, the UPPS-P evinced measurement and structural invariance across males and females (Cyders, 2013). Research in this area has also demonstrated robust associations between impulsivity-like facets and problematic alcohol consumption (see Littlefield, Stevens, & Sher, 2014, for a review) and other problematic substance use (e.g., Zapolski, Cyders, & Smith, 2009) among more homogenous samples.

However, there is a lack of research in this area with regard to racial and ethnic differences. Much of the extant knowledge in this area has been gleaned through the assessment of White male undergraduates (e.g., Balodis, Potenza, & Olmstead, 2009), and there is need for examining these relations with more diverse samples (see Public Health Service Act, 1993). For example, the population of individuals who identify as Hispanic and/or Latino is one of the fastest-growing ethnic minority populations in the United States. Between 2014 and 2015, the population of individuals who identify as Hispanic/Latino increased by 1.2 million, accounting for nearly half of the total population growth in the U.S. and 17.6% of the total U.S. population in 2015 (U.S. Census Bureau, 2016). Moreover, Hispanic/Latino individuals have the highest rates of alcohol use after their White peers (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2016) and are more likely to experience negative alcohol-related consequences and alcohol use disorders (e.g., Chartier & Caetano, 2010). Further, impulsivity has been linked to several constructs relevant to Hispanic populations, including machismo (e.g., Arciniega, Anderson, Tovar-Blank, & Tracey, 2008). Given the robust link between impulsivity-like facets and alcohol, as well as other types of substance use (see Berg, Latzman, Bliwise, & Lilienfeld, 2015 and Coskunpinar, Dir, & Cyders, 2013 for meta-analyses of the UPPS-P and impulsivity-related outcomes), examining facets which may put Hispanic/Latino individuals at risk for problematic alcohol and other substance use is warranted.

To date, measurement invariance across Hispanic/Latino and non-Hispanic/Latino ethnicities using the UPPS-P has not been established. This is a necessary step for determining whether Hispanic/Latino and non-Hispanic/Latino individuals differ with regard to impulsivity-like facets and understanding how these facets contribute to alcohol and substance use, as well as related consequences. Without established measurement invariance, the differences in endorsement of UPPS-P subscales may not be due to true differences in impulsivity-like facets as the scale was designed to measure, but instead due to some characteristic of the ethnicity group that impacts measurement. Indeed, even adjusting for Hispanic/Latino status in models that include UPPS-P measures and relevant outcomes requires (or assumes) measurement invariance.

Therefore, the purpose of this study was to test whether the UPPS-P Impulsive Behavior Scale exhibited measurement invariance across Hispanic/Latino and non-Hispanic/Latino college students. Additionally, we sought to determine whether the relation between impulsivity-like facets and alcohol and substance use endorsement differs as a function of ethnicity. Because this is, to our knowledge, the first examination of measurement invariance across the two largest ethnic groups in the U.S. using the UPPS-P, no specific hypotheses were proffered with regard to measurement invariance analyses or SEMs examining moderation (e.g., $PU \times$ Ethnicity Interactions for Alcohol- and Substance-Related Outcomes); however, we hypothesized that impulsivity-like facets

would be positively associated with greater endorsement of past-month alcohol and other substance use across ethnicities.

Method

Participants

Participants ($N = 718$; Hispanic/Latino $n = 186$) consisted of undergraduates from a large, southwestern university enrolled in introductory psychology courses. The overall sample (used in invariance analyses) had a mean age of 19.00 ($SD = 1.33$), and the majority of the sample identified as female (66%) and White (66%), with a minority identifying as Hispanic/Latino (25%). Subgroups (i.e., non-Hispanic/Latino vs. Hispanic/Latino) did not significantly differ with respect to age, gender, class status, or relationship status. Individuals identifying as Hispanic/Latino endorsed the following Hispanic origins or ancestries: 2% Puerto Rican, .25% Dominican, 11% Mexican, 15% Mexican American, .76% Chicano, 1% Cuban American, 3% Central or South American, 2% other Latin American, and 4% other Hispanic. Nine percent of individuals endorsed more than one Hispanic origin or ancestry.

Materials and Procedures

All participants completed a battery of demographic questions and self-report measures online and received research credit for their participation. All procedures and measures were approved by the university's Institutional Review Board.

Impulsigenic traits. Impulsivity-like traits were assessed using the 59-item self-report UPPS-P Impulsive Behavior Scale (Lynam et al., 2007). Participants were instructed to select which number on the 4-point Likert scale best described his or her behavior, with higher subscale sum scores reflecting higher impulsivity. Estimates of scale reliability (see Wang & Wang, 2012) for non-Hispanic/Latino and Hispanic/Latino were, respectively, .96, .96 (PU), .91, .91 (NU), .91, .89 (SS), .93, .90 (LPer), and .92, .91 (LPlan).

Alcohol and substance use. Past-month alcohol and substance use was assessed using select items from the American Drug and Alcohol Survey—Adolescent Version (ADAS; Rocky Mountain Behavioral Science Institute, 2003). Specifically, alcohol problems were assessed using a 15-item continuous measure of total problems endorsed ($\alpha = .86$). Past-month cigarette and smokeless tobacco use were assessed separately using binary response options. Past-month depressant use was assessed via endorsement of past-month tranquilizer use, past-month barbiturate use, and/or past-month narcotic use, and was transformed into a binary item given the relatively low endorsement of frequent past-month depressant use. Similarly, past-month stimulant use (i.e., "Have you used stimulants just to get high or taken an extra dose just to get high in the last month?") was also transformed into a binary item. All binary responses were coded such that 1 reflected endorsement of use (i.e., 0 = no, 1 = yes).

Analytic Strategy

First, exploratory data analyses were conducted to assess for normality. Alcohol problems (i.e., a continuous outcome) and all

impulsivity-like facets were normally distributed (i.e., skewness and kurtosis between -1.00 and $+1.00$; Fox, 2008). Distributions of some ADAS item responses were non-normal; specifically, past-month alcohol intoxication (i.e., "How often in the last month have you gotten drunk?") and past-month marijuana use (i.e., "How often in the last month have you used marijuana?") indicated that participants endorsed "10–19 times" and "20 or more times" for alcohol intoxication and "3–9 times," "10–19 times," "20 or more times," and "several times a day" for marijuana use at low frequencies; therefore, raw items were rescaled such that low (i.e., less than 10% of the restricted sample) endorsement response categories were collapsed, which resulted in four response categories for past-month alcohol intoxication (i.e., "none," "1–2 times," "3–9 times," "10 or more times") and three response categories for past-month marijuana use (i.e., "none," "1–2 times," and "3 or more times"). All data management and coding were conducted using SAS 9.4™ software (SAS Institute Inc., Cary, NC).¹

Consistent with similar work (see Treloar, Martens, & McCarthy, 2014), all measurement invariance analyses were conducted in Mplus 7.11 (Muthén & Muthén, 1998–2012) using weighted-least-squares mean and variance estimation for missing data (WLSMV²; see Asparouhov & Muthén, 2010) and delta parameterization to handle Likert-type items (i.e., categorical indicators and threshold structure; Muthén & Satorra, 1995). Measurement invariance (i.e., configural and scalar) were tested with multigroup CFA models. Tests of invariance were conducted on the overall factor structure of the UPPS-P, as well as for each subscale of the UPPS-P. For the overall factor structure, configural invariance was established by testing the model fit across Hispanic/Latino and non-Hispanic/Latino participants when no equality constraints were imposed (see Wang & Wang, 2012). That is, scale factors and factor variances were fixed to one, and factor means to zero for both groups, whereas all remaining parameters (i.e., factor loadings and thresholds) were freely estimated. The respective configural model served as the baseline for comparison in all subsequent tests of scalar invariance. Notably, multigroup CFA models with categorical indicators must simultaneously consider both thresholds and factor loadings, and thus a test of metric invariance (i.e., invariance of the factor loadings) was not permissible (Muthén & Muthén, 1998–2012, p. 485).

To test for scalar invariance (i.e., invariance of the factor loadings and thresholds), the configural model was compared to a more constrained model with the following conditions: all factor loadings (λ) and thresholds (i.e., number of response categories minus one: τ_1, τ_2, τ_3) constrained to be equal, factor variances set to one in both groups, scale factors fixed to one and factor means fixed to zero for the non-Hispanic/Latino participant group only, and scale factors and factor means freely estimated in the Hispanic/Latino participant group (see Muthén & Muthén, 1998–2012, p. 485). To test for scalar invariance on the overall factor structure, factor covariances were allowed to freely estimate across groups in one model and were constrained to be equal across groups in a separate model (i.e., a more constrained model). Tests of invariance for each subscale followed the same protocol outlined above. All model comparisons were made using the DIFFTEST option in Mplus (Muthén & Muthén, 1998–2012). Nonsignificant DIFFTEST results (i.e., $p > .05$) evidenced invariance across groups.

Given the use of WLSMV, traditional chi-square difference tests (i.e., taking the difference between the chi-square values and the difference in the degrees of freedom), are not appropriate in this case, as the chi-square difference is not chi-square distributed (see Muthén & Muthén, 1998–2012, p. 451). The following fit indices are reported for all models: comparative fit index (CFI) and root mean square error approximation (RMSEA).³ Guidelines for CFI values suggest that .90 represents "good" fit to the data, and .95 represents "excellent" fit (Hu & Bentler, 1999). RMSEA values of .05 (or below) indicate a closer fit to the data, whereas .08 and .10 represent fair and marginal fit, respectively (Browne & Cudeck, 1993).

To assess whether relations between impulsivity-like facets and alcohol use, as well as other types of substance use, differed as a function of ethnicity (i.e., Hispanic/Latino and non-Hispanic/Latino), SEMs using latent variable/manifest variable interactions (e.g., PU \times Ethnicity) were estimated for each impulsivity-like facet and outcome using Mplus in a restricted sample (i.e., excluding lifetime alcohol abstainers; $n = 130$). The restricted sample ($n = 588$) also had a mean age of 19.05 ($SD = 1.37$), and primarily identified as female (66%) and White (72%), with a minority identifying as Hispanic/Latino (26%). Impulsivity-like facets were modeled as latent variables with subscale items set as categorical indicators. Ethnicity and all outcomes were treated as manifest (i.e., observed) variables. Main effect models (i.e., using TYPE = GENERAL) were tested separately for each alcohol and substance outcome and impulsivity-like facet. Next, latent variable interaction models using random-effects model were estimated (i.e., using TYPE = RANDOM; ALGORITHM = INTEGRATION). WLSMV was used for categorical outcomes and maximum likelihood was used to estimate missing data for continuous outcomes (i.e., total alcohol problems). Mplus does not provide standardized estimates or standard model fit indices using these estimation procedures.

Prior to conducting the SEMs, the proportional odds assumption was tested in SAS for outcomes with multiple response categories (i.e., past-month alcohol intoxication and past-month marijuana use). It is advantageous to assume proportional odds when feasible, as the ordinal logistic model is more parsimonious (i.e., one vs. multiple logits, as in multinomial logistic models; see Agresti, 2002, p. 282). However, when the proportional odds assumption was violated (score test $\chi^2 = 4.29, p < .05$), a multinomial logistic model was conducted (i.e., past-month marijuana use for SS). Otherwise, ordinal logistic models were used to model outcomes. All SEMs were adjusted for self-identified gender and age.

Results and Discussion

All configural and scalar models demonstrated adequate model fit (see Table 1 for model fit indices). The assumption of scalar invariance was met for the overall five-factor structure of the

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² Given the use of categorical endogenous indicators in these analyses, WLSMV is recommended because it provides consistent estimates of parameters and unbiased standard errors (Muthén & Satorra, 1995).

³ Given the high correlation between the CFI and the Tucker-Lewis index, it is recommended to only report one of the two fit indices (Kenny, 2015).

Table 1
Measurement Invariance Summary Fit Statistics

Model	df	CFI	RMSEA	DIFF TEST (p value)
Overall model				
Configural model	3,285	.91	.05	
Scalar model	3,459	.92	.05	167.41 (.62)
Positive urgency				
Configural model	154	.97	.10	
Scalar model	195	.99	.07	33.74 (.78)
Negative urgency				
Configural model	108	.96	.09	
Scalar model	143	.98	.06	43.82 (.15)
Lack-of-planning				
Configural model	88	.97	.08	
Scalar model	120	.98	.05	40.65 (.14)
Lack-of-perseverance				
Configural model	70	.96	.10	
Scalar model	99	.98	.06	31.32 (.35)
Sensation seeking				
Configural model	108	.93	.11	
Scalar model	143	.96	.08	40.15 (.25)

Note. $N = 718$. CFI = comparative fit index; RMSEA = root mean square error of approximation; DIFF TEST = chi-square difference testing between the configural and scalar model. The overall model refers to the test of measurement invariance on the overall five-factor structure of the UPPS-P. The scalar model reported for the overall model refers to the most constrained model where factor covariances were constrained to be equal across groups. Given the use of weighted-least-squares mean and variance estimation, a traditional chi-square difference test is not appropriate and therefore not reported (see Muthén & Muthén, 1998–2012, p. 451).

UPPS-P, as well as the five separate subscales when compared to the configural models (i.e., statistically nonsignificant DIFFTEST; see Table 1). This study is the first to examine whether the psychometric properties of the UPPS-P (Lynam et al., 2007) vary by ethnicity. Results indicated that the measurement parameters of the UPPS-P are invariant across college-attending Hispanic/Latino and non-Hispanic/Latino individuals, which suggests that the endorsement of impulsivity-like facets using this measure can be reliably compared between these two groups. Specifically, any differences found between these two groups are thought to reflect meaningful differences in facet scores (e.g., higher levels of PU), as opposed to potential measurement differences across groups (Wang & Wang, 2012). Given its strong psychometric properties and measurement and structural invariance across gender (e.g., Cyders, 2013), in addition to the measurement invariance across Hispanic/Latino and non-Hispanic/Latino college student groups demonstrated in the present study, it is recommended that researchers prioritize use of the UPPS-P when examining differences in impulsivity-like facets across gender and/or ethnicity. It is also recommended that measurement invariance be established prior to examining construct differences across groups to further advance research in this area.

After establishing measurement invariance, differences in UPPS-P subscale endorsement were examined between Hispanic/Latino and non-Hispanic/Latino groups, as well as the interaction between ethnicity and impulsivity-like facets predicting alcohol and other substance use using SEMs. To test for latent mean differences in separate subscales across groups, the Hispanic/Latino group's latent means were allowed to freely estimate while

constraining the non-Hispanic/Latino group's latent means to zero. Factor variances were also set to one across groups, such that the mean differences represented effect sizes. Across all subscales, the latent mean differences were statistically nonsignificant (i.e., PU, $d = .12$; NU, $d = .12$; SS, $d = .05$; LPer, $d = .09$; LPlan, $d = -.06$; $ps = .18-.56$).

All main effect SEMs evidenced adequate-to-good fit to the data (CFI = .93–.98, RMSEA = .06–.09). Using ordinal logistic regression, past-month alcohol intoxication (PU, $\beta = .24$; NU, $\beta = .24$; SS, $\beta = .17$; LPer, $\beta = .24$; LPlan, $\beta = .35$) past-month marijuana use (PU, $\beta = .15$; NU, $\beta = .20$; SS, $\beta = .15$; LPer, $\beta = .17$; LPlan, $\beta = .25$), and past-month cigarette use (PU, $\beta = .15$; NU, $\beta = .25$; SS, $\beta = .20$; LPer, $\beta = .16$; LPlan, $\beta = .15$) were positively predicted by all five facets of impulsivity-like traits ($ps < .05$). However, using multinomial logistic regression (due to a violation of the proportional odds assumption for past-month marijuana use), for every 1-point increase in SS, the log-odds of endorsing “none” compared to “3 or more times” for past-month marijuana use decreased by .60 while holding all other variables constant ($p < .05$). Endorsement of “1–2 times” versus the reference group (i.e., “3 or more times”) for past-month marijuana use on SS was statistically nonsignificant.

Past-month stimulant use (PU, $\beta = .30$; NU, $\beta = .30$; LPer, $\beta = .28$; LPlan, $\beta = .28$) and past-month depressant use (PU, $\beta = .39$; NU, $\beta = .27$; LPer, $\beta = .29$; LPlan, $\beta = .35$), separately, were significantly positively related to all impulsivity-like facets *except* SS. Likewise, all impulsivity-like facets *except* SS were positively predictive of total alcohol problems (PU $\beta = .26$, NU $\beta = .32$, LPer $\beta = .23$, LPlan $\beta = .22$). Past-month smokeless tobacco use was positively associated with NU ($\beta = .20$), PU ($\beta = .23$), SS ($\beta = .20$), and LPlan ($\beta = .15$). The interaction between SS and ethnicity predicting past-month smokeless tobacco use was statistically significant. Specifically, non-Hispanic/Latino individuals were more likely to use smokeless tobacco use when higher in SS ($B = 1.11$, $p < .01$), whereas Hispanic/Latino individuals were less likely to use smokeless tobacco with every one-point increase in SS ($B = -1.12$, $p < .01$). All other latent variable interactions were statistically nonsignificant.

Consistent with previous research, all impulsivity-like facets were significantly predictive of past-month alcohol intoxication (Coskunpinar et al., 2013). Interestingly, SS was the only impulsivity-like facet that did not significantly predict alcohol problems, in line with a recent meta-analysis, which demonstrated the weakest effect size with alcohol problems (i.e., $r = .17$) compared to other impulsivity-like facets (Coskunpinar et al., 2013). Findings from the current study also support previous research examining the relations between impulsivity-like facets and cigarette use (Spillane, Smith, & Kahler, 2010). Likewise, Dvorak and Day (2014) found that marijuana use is significantly related to impulsivity-like facet higher-order factors (i.e., SS, urgency [PU and NU], and self-control [LPer and LPlan]). However, despite much research on the UPPS-P and adolescent cannabis use (see VanderVeen, Hersherberger, & Cyders, 2016), this is the first study to directly test the association between the five separate UPPS-P impulsivity-like facets and past-month marijuana use in a college sample. Further, given the relatively low base rate of smokeless tobacco use compared to cigarette use (e.g., 9.01% vs. 22.96%, respectively, in the current sample of U.S. college students), relations between smokeless tobacco use and impulsivity-

like facets have been largely neglected in the extant literature; however, previous research examining relations between SS and novel nicotine products (i.e., hookah, little cigars, and e-cigarettes) also found a positive relation between SS and nicotine use in a predominantly White sample (Hampson, Andrews, Severson, & Barckley, 2015). However, this is the first study to explore the relations among Hispanic/Latino ethnicity, SS, and nicotine use.

Contrary to prior findings, current results indicated a relation between past-month stimulant use and all impulsivity-like facets except SS. Using a college sample, Lookatch, Dunne, and Katz (2012) found significant relations between stimulant use and SS; however, this relation became nonsignificant when adjusting for expectancies and motives, which indicates that the relation between these two constructs might be better explained by a third variable (Lookatch et al., 2012). Similarly, past-month depressant use was significantly associated with all impulsivity-like facets except SS, which has been supported in previous studies (e.g., see Marino et al., 2013).

Individuals may identify as Hispanic/Latino in the United States based on different markers (e.g., country of origin), which yields diverse subgroups comprising this ethnicity. Moreover, the heterogeneity within samples of Hispanics/Latino individuals who use substances is well documented (see Alvarez, Jason, Olson, Ferrari, & Davis, 2007). By aggregating responses of potentially heterogeneous groups into one, results of the current study may not be generalizable to specific subgroups among those who identify as Hispanic/Latino (e.g., those who identify as Mexican) or to individuals outside of the young, college student demographic; further, acculturation was not examined. The current findings are also limited to the associations between impulsivity-like facets and substance use, as well as alcohol use and related consequences. Future research should examine associations with substance use disorders by ethnicity.

Although more nuanced investigations are warranted to better understand the impulsivity-substance use relation among Hispanic/Latino individuals (e.g., subgroup-level analyses, role of acculturative stress), the current study adds to the existing literature by establishing measurement invariance on the well-validated and widely used UPPS-P, across the two largest ethnic groups in the United States. No differences between Hispanic/Latino versus non-Hispanic/Latino individuals indicated similar facet-level impulsivity across groups. Although ethnicity did not moderate the impulsivity-substance use relation for a number of outcomes, non-Hispanic/Latino individuals were more likely to engage in smokeless tobacco use when higher in SS. More research in this area is critical to better serve individuals within this growing U.S. minority ethnic group; however, the current study provided the necessary first step toward examining impulsivity-like traits and associated behaviors among Hispanic/Latino individuals.

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