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Testing the Acquired Preparedness Model: Predicting College Student Gambling Frequency and Symptomatology

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Abstract

The acquired preparedness model posits that impulsivity influences the development of outcome expectancies that then influence the engagement in a specific risk taking behavior. The purpose of this study was to test the acquired preparedness model for gambling behavior of college students using a multidimensional approach to impulsivity. Employing a structural equation approach, it was predicted that a full mediational model that includes multiple dimensions of impulsivity and multiple outcome expectancies would predict gambling frequency and gambling symptomatology. Support was found for the acquired preparedness model in understanding why some college students gamble more frequently or problematically. Specifically, better model fit was found for the full mediational model that included outcome expectancies to predict both frequency and gambling symptomatology than the model that included the direct relation between impulsivity and gambling.

The acquired preparedness model of substance abuse risk (Smith & Anderson, 2001) posits that impulsivity leads to selective attention to reward-related information. This bias, in turn, influences a person's outcome expectancies and ultimately the engagement in the risk taking behavior. Studies on various risk behaviors by college students have provided support for this model (e.g., Doran et al., 2012; McCarthy, Kroll, & Smith, 2001; Vangsness, Bry, Erich & Labouvie, 2005), but have not tested the model with gambling. The purpose of this study was to examine whether the acquired preparedness model can be used to evaluate the relation between three impulsivity dimensions and more proximal risk factors of outcome expectancies on gambling involvement and problematic gambling risk.

The acquired preparedness model is based on Patterson and Newman's (1993) operationalization of disinhibition as the tendency for individuals to impulsively seek reward

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and avoid punishment. Disinhibited individuals tend to focus on reward activities, engage in more risky behaviors, and learn reinforcing consequences for the risk behavior (Patterson & Newman, 1993). Impulsivity and disinhibition allow these individuals to better remember positive consequences (Wardell, Read, Colder & Merrill, 2012), and to develop outcome expectancies from their engagement in the risk behavior consistent with these remembered positive consequences (Vangsness et al., 2005).

Understanding the relation between dispositional factors, such as impulsivity and learned expectancies can advance our understanding of why individuals might begin to gamble in an excessive and symptomatic manner. Tests of the acquired preparedness model have shown expectancies to mediate impulsivity for alcohol use (McCarthy, Kroll & Smith, 2001; McCarthy, Miller, Smith & Smith, 2001), sexual behaviors (Dir, Cyders & Coskunpinar, 2013), smoking initiation (Doran et al., 2012), bulimic behaviors (Schaumberg & Earleywine, 2013), and marijuana use (Vagness, Bry, Erich & LaBouvie, 2005). Furthermore, tests of the acquired preparedness model that have used specific dimensions of impulsivity have supported a multidimensional relation of impulsivity and expectancies for various risk behaviors (Dir, Cyders & Coskunpinar, 2013; Doran et al., 2012; Schaumberg & Earleywine, 2013).

The literature on college student gambling is consistent with the tenets of the acquired preparedness model. Impulsivity has been related positively to gambling in college students (e.g., Breen & Zuckermann, 1999; Langewisch & Frisch, 1998; Powell et al., 1999). More recent efforts to operationalize impulsivity multidimensionally have offered additional support that impulsivity is a concept made up of multiple facets, particularly for gambling (e.g. Ginley, Whelan, Meyers, et al., 2013; Whiteside, Lynam, Miller, & Reynolds, 2005). Ginley, Whelan, Meyers, and colleagues (2013) administered a series of impulsivity related measures to a diverse sample of college students and revealed three impulsivity dimensions: behavioral activation, preference for stimulation, and inhibition control. These dimensions were differentially related to gambling frequency and gambling symptoms. The gambling literature also supports a relation between gambling outcome expectancies and gambling behavior (e.g., Shead & Hodgins, 2009; Wickwire, Whelan & Meyers, 2010). College students who expect gambling to bring affective relief are more likely to be moderate-risk or problematic gamblers (Shead & Hodgins, 2009). In a more recent college student based study, increased gambling frequency was shown to correspond specifically to expectancies for more positive self-evaluation, greater material gain, and more negative social consequences (Ginley, Whelan, Relyea, et al., 2013).

In the present study we tested the acquired preparedness model for gambling behavior of college students. It is hypothesized that the acquired preparedness model will apply to gambling. The influence of impulsivity will be better understood with the inclusion of individuals' gambling expectancies. Using a structural equation approach, we predicted that three gambling specific impulsivity dimensions will be uniquely mediated by gambling outcome expectancies that will in turn predict gambling frequency and symptomology.

Method

Participants

In order to capture a diverse participant sample, recruitment was completed at two universities and one college ($n = 355$) as part of a larger data collection. For inclusion in the study participants needed to be between 18 and 25 years of age ($M_{\text{age}} = 19.54$; $SD = 1.70$) as research has shown a marked decrease in impulsivity after age 25 years (Steinberg et al., 2008). Participants were 54.6% female ($n = 194$). The participants identified themselves as follows: 56.3% Caucasian, 31.5% African American, 3.1% Hispanic, 2.5% Asian, 0.6% American Indian, 0.3% Native Hawaiian or Other Pacific Islander, and 5.7% other.

Measures

Demographic Questionnaire—Participants completed a demographics questionnaire to assess their age, gender, race, and ethnicity.

National Opinion Research Center Diagnosis Screen (NODS)—The NODS (Toce-Gerstein, Gerstein, & Volberg, 2003) is based on the *DSM-IV* criteria for Pathological Gambling. It has a single factor structure and is sensitive for identifying pathological gambling among individuals aged 18 years and older (Toce-Gerstein et al., 2003). A score of 0 to 2 indicates low risk gamblers. A score of 3 or 4 indicates at-risk for disordered gambling. Five or greater equates to meeting diagnostic criteria. Given the base rate of at-risk and pathological gamblers, this project classified any gamblers experiencing adverse symptoms as symptomatic gamblers. Non-gamblers and low risk gamblers have overlapping scores of zero on gambling symptomatology. The NODS has been shown to have an internal consistency of 0.79 and to have a 2- to 4- week test-retest reliability of 0.98. It detects problem gambling in 95% of individuals receiving treatment for problem gambling (Hodgins, 2004).

Gambling Frequency Measure—The South Oaks Gambling Screen (Lesieur & Blume, 1987) frequency table was modified to assess the frequency of nine specific gambling activities. The original frequency table was expanded to request that for each gambling activity participants indicate whether they gambled, “Not at all,” “A few times a year,” “About once a month,” “About once a week,” “A few times per week,” and “Almost daily.” This modification allowed for a more precise estimate of gambling frequency. Gambling frequencies for each gambling activity and the total gambling frequency were calculated. Participants who did not report an activity frequency data point were scored a 0 for that gambling activity.

Barratt Impulsiveness Scale: 11th version (BIS-11)—The BIS-11 (Patton et al., 1995) was developed to assess biological and behavioral correlates of impulsiveness. Respondents ranked 30-items on a 4-point scale anchored to responses of “Rarely/Never,” “Occasionally,” “Often,” and “Almost Always.” There are three second-order factors or subscales (Stanford et al., 2009), attentional impulsiveness, motor impulsiveness, and nonplanning impulsiveness. Higher scores on any subscale indicate higher impulsivity

(Patton et al., 1995). When tested with undergraduates, BIS-11 total score had a Cronbach's alpha of 0.82 (Patton et al., 1995).

Behavioral Inhibition/ Behavioral Activation Scales (BIS/BAS)—This measure (Carver & White 1994) assesses both the behavioral inhibition (BIS) and behavioral approach systems (BAS) proposed in the Reinforcement Sensitivity Theory (Gray, 1970). Participants rate 24 questions on a 4-point scale (“Very true for me to “Very false for me”). High BIS predicts feelings of anxiety and withdrawal behavior when placed in a new situation and high BAS greater brain activation to positive events and a strengthened drive to behave in a way that produces desirable stimuli (Carver & White, 1994). A factor analysis of the BIS/BAS yielded three BAS-related subscales: Reward Responsiveness, Drive, and Fun-Seeking. A fourth subscale is the BIS, which is psychometrically independent from the BAS scales (Carver & White, 1994). With a college student sample, Cronbach's alpha ranged from 0.65 to .82 (Caseras, Avila & Torrubia, 2002).

Sensation Seeking Scale: Form V (SSS Form V)—This 40-item self-report measure indicates a person's affinity for or against a variety of activities considered risky behaviors or high sensation activities (Zuckerman, Eysneck, & Eysneck, 1978). The SSS Form V yields the total Sensation Seeking Score. (Zuckerman et al., 1978). In an analysis of reliability and validity with college students, the SSS Form V total score showed moderate reliability with a Cronbach's alpha of 0.75 (Ridgeway & Russell, 1980).

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)—The SPSRQ (Torrubia et al., 2001) was also developed from Gray's theory, but in evaluation has proved itself to be distinct from the BIS/BAS (Dawe & Loxton, 2004; Meda et al., 2009). The 48 yes-no questions assess two dimensions. The first, Sensitivity to Punishment (SP), assesses the inability to stop potential behavior when made aware of potential punishment, and the second, Sensitivity to Reward (SR), is the tendency to engage in goal-focused behavior in situations associated with reward (Torrubia et al., 2001). With a sample of college students, the Cronbach's alpha for SP was 0.83 and for SR was 0.76 (Caseras et al., 2003).

Padua Inventory (PI)—The 60-item PI (Sanavio, 1988) has been used to assess obsessiveness and compulsivity in community samples. The measure uses a five-point severity inventory (0 = not at all, 1 = a little, 2 = quite a lot, 3 = a lot, 4 = very much). A score is obtained by summing all responses. Cronbach's alpha with college students ranged from 0.77 to 0.89 (Sternberger & Burns, 1990).

Adolescent Gambling Expectancy Survey (AGES)—The AGES (Wickwire et al., 2010) was developed to assess adolescents' expectancies for the outcome of gambling. Item responses are in a bipolar format with two negative response options, a neutral response option, and two positive response options. The gambling outcome expectancies have been shown to factor into five domains: material gain/loss, affect, self-evaluation, social consequences, and parental disapproval. The AGES factors have been shown to have an internal consistency from .70 to .80 with a test-retest reliability from .54 to .76 (Wickwire et

al., 2010). The AGES factors have been replicated in a college student sample (Ginley, Whelan, Relyea, et al., 2013).

Procedure

The Institutional Review Board of each university approved the protocol prior to the start of data collection. The data reported here were part of a larger data collection looking at impulsivity as it relates to gambling and other health risk behaviors in college students. All participants were provided with informed consent materials that emphasized the voluntary participation, a participant's right to quit at any time, and steps that would be taken to ensure confidentiality. Those providing consent were then administered the assessment packet.

Data collection procedures varied slightly by site. At one university, participants were recruited from the undergraduate subject pool for participation in a larger study looking at predictors of risk behaviors in college students. They completed the survey questionnaires in an online format for course credit.

At the other institutions, participants completed the measures as part of general data collection for a study looking at biomarkers of substance use in a college sample (BARCS: RO1 AA016599 and RC1 AA019036 to Dr. Godfrey Pearlson; for complete description see Dager et al., 2012). These participants completed the gambling measures and the outcome expectancy questionnaire in paper and pencil form. Participants were paid \$20 per hour for the session.

Participants who had completed all the impulsivity measures, the gambling measures, and the outcome expectancy measures were included in the present study's analyses.

Results

Data Analysis

Ginley, Whelan, Meyers, and colleagues (2013) reported that three dimensions capture impulsivity in a prior analysis of this sample of college students: behavioral activation, preference for stimulation, and inhibition control. Behavioral activation measures desire for engagement in a risk behavior. It is comprised of three activation subscales of the BIS/BAS measure. Preference for stimulation captures individual's tendency to engage in risk behaviors. It consists of the Sensation Seeking Scale total score, the SPSRQ Sensitivity to Reward subscale, and the three BIS-11 subscales. Inhibition control corresponds to how individuals process high-risk behaviors and experience anxiety about potential poor outcomes. It consists of the SPSRQ Sensitivity to Punishment subscale, the inhibition subscale of the BIS/BAS measure, and the Padua total score.

A structural equation modeling (SEM) approach was adopted because the acquired preparedness model proposes that outcome expectancy fully mediates the influence of impulsivity on the risk behavior. A SEM approach is recommended when evidence or theory supports full mediation (James, Mluaik, & Brett, 2012). Data were analyzed using SAS/Stat (SAS Institute, 2008) Proc Calis and Mplus Version 5 (Muthén & Muthén, 1998-2001). The SEM models were estimated using weighted least squares (WLS) as initial analyses

indicated assumptions of multivariate normality might not be met given this data sample (as recommended by Jöreskog & Sörbom, 1989). Prior research supports the notion that SEM models are robust to handling this type of multivariate nonnormality (Lei & Lomax, 2005; Yuan, Bentler & Zhang, 2005). Separate SEM models were used for the observed outcome variables of gambling frequency and gambling symptomology. Impulsivity, the distal predictor of gambling risk, was modeled as three exogenous factor scores: behavioral activation, preference for stimulation, inhibition control. Gambling expectancies were entered as more proximal mediators for gambling risk. Gambling expectancies were included as five endogenous variables consisting of factor scale scores of affect, self-evaluation, social consequences, material gain/loss, and parental disapproval.

The development of each SEM model followed a two-step procedure. The first step tested model fit with all direct and indirect (mediated) effects entered into the model. The results of the first step provide fit statistics for the direct model of behavioral activation, inhibition control, and preference for stimulation on gambling frequency or symptomology, or a partial mediation model where the indirect effects of outcome expectancies are present in the model along with the direct effects of the impulsivity factors. In the second step a reduced SEM model was estimated by removing the direct effects of behavioral activation, inhibition control and preference for stimulation on gambling frequency or symptomatology and then compared to the full model. This second model is a full mediation model where all effects of the impulsivity factors are mediated by outcome expectancy factors.

Gambling Frequency

The initial model resulted in an overall fit ($\chi^2 = 83.02$, $df = 10$), GFI = 0.95, RMSEA = 0.14 (90% CI: 0.12, 0.17). The reduced model resulted in an overall fit of ($\chi^2 = 91.03$, $df = 13$), GFI = 0.94, RMSEA = 0.13 (90% CI: 0.11, 0.16). Comparing the initial model with the reduced model indicated adoption of the reduced model; model change, $\chi^2 = 4.38$, $df = 3$, $p = .22$. The reduced model is a full mediation model. These findings suggest that the hypothesized acquired preparedness model best fits the data when impulsivity factors are fully mediated by outcome expectancy factors. For full illustration of the model, see Figure 1.

Statistically significant relations were found between each impulsivity dimension and gambling frequency when mediated by gambling outcome expectancies. Behavioral activation had a significant total indirect effect on gambling when mediated by expectancies of more negative outcomes (estimated unstandardized total effect = -0.74 , $p < .001$). Preference for stimulation was found to have a significant total indirect effect on gambling when mediated by more positive gambling expectancies (estimated total unstandardized effect = 0.94 , $p < .001$). Inhibition control was found to have a significant total indirect effects on gambling when mediated by more negative gambling expectancies (estimated unstandardized total effect = -0.55 , $p < .001$). For total indirect and specific indirect effects for gambling frequency, see Table 1.

Gambling Symptomology

The initial model resulted in an overall fit ($\chi^2 = 83.69$, $df = 10$), $GFI = 0.95$, $RMSEA = 0.14$ (90% CI: 0.12, 0.17). The reduced model resulted in an overall fit of ($\chi^2 = 89.27$, $df = 13$), $GFI = 0.94$, $RMSEA = 0.13$ (90% CI: 0.10, 0.15). Comparing the full model with the reduced model indicated adoption of the reduced model, model change, $\chi^2 = 5.58$, $df = 3$, $p = .13$. These findings support the acceptance of the fully mediational role of outcome expectancies for explaining gambling symptomatology. Again for gambling symptomology, as was the case for gambling frequency, the hypothesized acquired preparedness model best fits the data when the impulsivity factors are fully mediated by outcome expectancy factors. For full illustration of the model, see Figure 2.

Gambling outcome expectancies also mediated the relation between each of the impulsivity dimensions and gambling symptomatology. Behavioral activation was found to have a significant total indirect effect on gambling symptomatology when mediated by more negative gambling expectancies (estimated unstandardized total effect = -0.07 , $p < .001$). Preference for stimulation was found to have a significant total indirect effect on gambling symptomatology when mediated by more positive gambling expectancies (estimated unstandardized total effect = 0.12 , $p < .001$). Inhibition control was found to have a significant total indirect effect on gambling symptomatology when mediated by more negative gambling expectancies (estimated total effect = -0.02 , $p < .001$). For total indirect and specific indirect effects for gambling symptomatology, see Table 2.

Discussion

These findings support the value of the acquired preparedness model in understanding why some college students gamble more frequently or problematically. Specifically, the full mediational model that included impulsivity and outcome expectancies robustly predicted both frequency and gambling symptomatology. In addition, this study provided further support for a multidimensional measurement of impulsivity (e.g., Dir, Cyders & Coskunpinar, 2013; Doran et al., 2012; Schaumberg & Earleywine, 2013). In this case, we found that three gambling specific impulsivity dimensions were each related to gambling activity and symptomology, and these relations were uniquely mediated by different gambling outcome expectancies.

Concerns about college student gambling create a need for increased understanding of influences on engagement in risk behaviors (e.g., Nowak & Aloe, 2013; Weinstock, Whelan, & Meyers, 2008). The acquired preparedness model allows for the combined assessment of impulsivity, a dispositional factor, and outcome expectancies, learned factors. The findings of this study suggest that the steps towards gambling risk behaviors follow a similar trajectory to those of risky alcohol use (McCarthy, Kroll & Smith, 2001; McCarthy, Miller, Smith & Smith, 2001), drug use (Vagness, Bry, Erich & LaBouvie, 2005), and engagement in other risk behaviors (Dir, Cyders & Coskunpinar, 2013; Doran et al., 2012; Schaumberg & Earleywine, 2013).

As was hypothesized, examining impulsivity in a multidimensional model, and choosing outcome expectancies that capture a diverse set of possible experiences, allowed for a more

precise understanding of the facets of impulsivity that can lead to the development of different outcome expectancies. These outcome expectancies then can differentially predict gambling risk. Our hypothesis that increased impulsivity, combined with expectations that more positive things would happen when one gambles, would be related to increased gambling frequency and symptomology appears to have been too simple. We found that different impulsivity dimensions correspond more strongly with positive or negative expectancies. These positive or negative expectancies in turn appear to differentially correspond with increased gambling frequency and pathology.

Behavioral activation measures the attraction to the risk behavior due to the reward stimuli and is not necessarily related to the engagement in the behavior itself. It is noteworthy that the present study found that high behavioral activation and more negative expectancies were associated with higher gambling frequency and symptomology. Our finding is in contrast to research on marijuana use that has shown that negative expectancies appeared to predict never having smoked and level of drug use (Aarons et al., 2001; Schafer & Brown, 1991; Vangsness et al., 2001). A possible explanation for this difference is that behavioral approach to the potentially rewarding situation of gambling leads to increased gambling behavior despite negative expectancies. Alternatively, given the cross sectional nature of this study, those who gamble at higher rates may be sensitized to common negative experiences they have already encountered when gambling.

Preference for stimulation gauges intent to initiate the risk behavior. Having high preference for stimulation and more positive expectancies corresponded to higher gambling frequency. This finding replicates results from other tests of the acquired preparedness model where positive expectancies have also been shown to be predictive of smoking, eating disorder symptoms, and alcohol use (Doran et al., 2012, McCarthy et al., 2001; Schaumberg & Earleywine, 2013).

Inhibition control measures sensitivity to punishment and initiation of behavioral withdrawal. Scores high on inhibition control combined with negative expectancies corresponded to significantly higher gambling frequency and higher gambling symptomology. This finding is consistent with research on alcohol use that found expectations that one will lose control while drinking predicted increased drinking (Kabbani & Kambouropoulos, 2013). It is possible that loss of control and escape, common symptoms of problematic gambling, are also being captured here. For individuals high on inhibition control, this may be a particularly salient expectancy leading to gambling risk. Alternatively, given the cross sectional design of this study, it is possible these individuals with high inhibition have been gambling at high rates, are experiencing negative consequences, and in turn reporting their negative experiences.

While this study provides support for the acquired preparedness model in gambling college students, it is not without limitations. As with prior tests of the acquired preparedness model, the data collection for this study was cross sectional. While research supports the notion that impulsivity is a predisposition formed early in life, and expectancies in turn form from life experiences, it is impossible to draw causal relations or specific estimates of the degree of the effect of impulsivity on outcome expectancies without longitudinal data. An additional

limitation of this study was the overall low rates of gambling symptomology. That we were still able to find significant effects despite low symptomology rates speaks to the potential strengths of these findings, but replication must be repeated with a high pathology sample to strengthen the results.

Despite these limitations, support for the application of the acquired preparedness model in predicting who may gamble and why is valuable. The results replicate a complex theory in a new addictive behavior. The findings further inform how impulsivity and learning history combine to create an opportunity for risk. In addition, these findings highlight fundamental similarities that gambling shares with other behavioral and chemical addictions.

Interestingly, while providing support for the model, our findings and the results of other tests of the acquired preparedness model also reveal that the relation between dispositional and learned variables may not be the same across risk behaviors.

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References

- Aarons GA, Brown SA, Stice E, Coe MT. Psychometric evaluation of the Marijuana and Stimulant Effect Expectancy Questionnaires for adolescents. *Addictive Behaviors*. 2001; 26(2):219–236. doi: 10.1016/S0306-4603(00)00103-9. [PubMed: 11316378]
- Breen RB, Zuckerman M. ‘Chasing’ in gambling behavior: Personality and cognitive determinants. *Personality and Individual Differences*. 1999; 27(6):1097–1111. doi:10.1016/S0191-8869(99)00052-5.
- Carver C, White T. Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*. 1994; 67(2):319–333. doi:10.1037/0022-3514.67.2.319.
- Caseras X, Ávila C, Torrubia R. The measurement of individual differences in Behavioural Inhibition and Behavioural Activation Systems: A comparison of personality scales. *Personality and Individual Differences*. 2003; 34(6):999–1013. doi:10.1016/S0191-8869(02)00084-3.
- Dawe S, Loxton N. The role of impulsivity in the development of substance use and eating disorders. *Neuroscience and Biobehavioral Reviews*. 2004; 28(3):343–351. doi:10.1016/j.neubiorev.2004.03.007. [PubMed: 15225976]
- Dager AD, Anderson BM, Stevens MC, Pulido C, Rosen R, Jiantonio-Kelly RE, Pearlson GD. Influence of Alcohol Use and Family History of Alcoholism on Neural Response to Alcohol Cues in College Drinkers. *Alcoholism: Clinical and Experimental Research*. 2012 doi: 10.1111/j.1530-0277.2012.01879.x.

- Dir AL, Cyders MA, Coskunpinar A. From the bar to the bed via mobile phone: A first test of the role of problematic alcohol use, sexting, and impulsivity-related traits in sexual hookups. *Computers in Human Behavior*. 2013; 29(4):1664–1670. doi:10.1016/j.chb.2013.01.039.
- Doran N, Khoddam R, Sanders PE, Schweizer C, Trim RS, Myers MG. A Prospective Study of the Acquired Preparedness Model: The Effects of Impulsivity and Expectancies on Smoking Initiation in College Students. *Psychology of Addictive Behaviors*. 2012 doi:10.1037/a0028988.
- Ginley MK, Whelan JP, Meyers AW, Relyea GE, Pearlson GD. Exploring a Multidimensional Approach to Impulsivity in Predicting College Student Gambling. *Journal of Gambling Studies*. 2013:1–16. doi:10.1007/s10899-013-9374-9. [PubMed: 22138931]
- Ginley MK, Whelan JP, Relyea GE, Simmons JL, Meyers AW, Pearlson GD. College Student Beliefs About Wagering: An Evaluation of the Adolescent Gambling Expectancies Survey. *Journal of Gambling Studies*. 2013:1–11. doi: 10.1007/s10899-013-9403-8. [PubMed: 22138931]
- Gray JA. The psychophysiological basis of introversion-extraversion. *Behaviour Research and Therapy*. 1970; 8(3):249–266. doi:10.1016/0005-7967(70)90069-0. [PubMed: 5470377]
- Hodgins D. Using the NORC DSM Screen for Gambling Problems as an outcome measure for pathological gambling: Psychometric evaluation. *Addictive Behaviors*. 2004; 29(8):1685–1690. doi:10.1016/j.addbeh.2004.03.017. [PubMed: 15451138]
- James LR, Mulaik SA, Brett JM. A tale of two methods. *Organizational Research Methods*. 2006; 9(2):233–244.
- Jöreskog, KG.; Sörbom, D. LISREL 7: A guide to the program and applications (Vol. 2). SPSS; Chicago: 1989.
- Kabbani R, Kambouropoulos N. Positive expectancies and perceived impaired control mediate the influence of reward drive and rash impulsiveness on alcohol use. *Personality and Individual Differences*. 2012 doi: <http://dx.doi.org/10.1016/j.paid.2012.08.008>.
- Langewisch MJ, Frisch G. Gambling behavior and pathology in relation to impulsivity, sensation seeking, and risk behavior in male college students. *Journal of Gambling Studies*. 1998; 14(3): 245–262. doi:10.1023/A:1022005625498.
- Lei M, Lomax RG. The Effect of Varying Degrees of Nonnormality in Structural Equation Modeling. *Structural Equation Modeling*. 2005; 12(1):1–27. doi:10.1207/s15328007sem1201_1.
- Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *The American Journal of Psychiatry*. 1987; 144(9):1184–1188. Retrieved from EBSCOhost. [PubMed: 3631315]
- McCarthy DM, Kroll LS, Smith GT. Integrating disinhibition and learning risk for alcohol use. *Experimental and Clinical Psychopharmacology*. 2001; 9(4):389–398. doi: 10.1037/1064-1297.9.4.389. [PubMed: 11764015]
- McCarthy DM, Miller TL, Smith GT, Smith JA. Disinhibition and expectancy in risk for alcohol use: Comparing Black and White college samples. *Journal of Studies on Alcohol*. 2001; 62(3):313–321. [PubMed: 11414341]
- Meda SA, Stevens MC, Potenza MN, Pittman B, Gueorguieva R, Andrews MM, Pearlson GD. Investigating the behavioral and self-report constructs of impulsivity domains using principal component analysis. *Behavioural Pharmacology*. 2009; 20(5-6):390–399. doi:10.1097/FBP.0b013e32833113a3. [PubMed: 19724194]
- Muthén, LK.; Muthén, BO. Mplus User's Guide. Sixth Edition.. Muthén & Muthén; Los Angeles, CA: 1998-2011.
- Nowak DE, Aloe AM. The prevalence of pathological gambling among college students: A meta-analytic synthesis, 2005–2013. *Journal of Gambling Studies*. 2013:1–25. doi: 10.1007/s10899-013-9399-0. [PubMed: 22138931]
- Patterson C, Newman JP. Reflectivity and learning from aversive events: Toward a psychological mechanism for the syndromes of disinhibition. *Psychological Review*. 1993; 100(4):716–736. doi: 10.1037/0033-295X.100.4.716. [PubMed: 8255955]
- Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology*. 1995; 51(6):768–774. doi:10.1002/1097-4679(199511)51:6<768::AID-JCLP2270510607>3.0.CO;2-1. [PubMed: 8778124]

- Powell J, Hardoon K, Derevensky JL, Gupta R. Gambling and risk-taking behavior among university students. *Substance Use & Misuse*. 1999; 34(8):1167–1184. doi:10.3109/10826089909039402. [PubMed: 10359227]
- Ridgeway D, Russell JA. Reliability and validity of the Sensation-Seeking Scale: Psychometric problems in Form V. *Journal of Consulting and Clinical Psychology*. 1980; 48(5):662–664. doi: 10.1037/0022-006X.48.5.662.
- SAS Institute Inc.. SAS/STAT® 9.2 User's Guide. SAS Institute Inc.; Cary, NC: 2008.
- Sanavio E. Obsessions and compulsions: The Padua Inventory. *Behaviour Research and Therapy*. 1988; 26(2):169–177. doi:10.1016/0005-7967(88)90116-7. [PubMed: 3365207]
- Schaumburg K, Earleywine M. Evaluating the acquired preparedness model for bulimic symptoms and problem drinking in male and female college students. *Eating Behaviors*. 2013; 14(1):47–52. doi: 10.1016/j.eatbeh.2012.10.012. [PubMed: 23265401]
- Schafer L, Brown SA. Marijuana and cocaine effect expectancies and drug use patterns. *Journal of Consulting and Clinical Psychology*. 1991; 59:558–565. doi:10.1037/0022-006X.59.4.558. [PubMed: 1918560]
- Shead N, Hodgins DC. Affect-regulation expectancies among gamblers. *Journal of Gambling Studies*. 2009; 25(3):357–375. doi:10.1007/s10899-009-9131-2. [PubMed: 19582557]
- Smith GT, Anderson KG, Monti PM, Colby SM, O'Leary TA. Adolescent risk for alcohol problems as acquired preparedness: A model and suggestions for intervention. *Adolescents, alcohol, and substance abuse: Reaching teens through brief interventions*. 2001:109–144.
- Stanford MS, Mathias CW, Dougherty DM, Lake SL, Anderson NE, Patton JH. Fifty years of the Barratt Impulsiveness Scale: An update and review. *Personality and Individual Differences*. 2009; 47:385–395. doi: 10.1016/j.paid.2009.04.008.
- Sternberger L, Burns G. Obsessions and compulsions: Psychometric properties of the Padua Inventory with an American college population. *Behaviour Research and Therapy*. 1990; 28(4):341–345. doi:10.1016/0005-7967(90)90087-Y. [PubMed: 2222392]
- Toce-Gerstein M, Gerstein DR, Volberg RA. A hierarchy of gambling disorders in the community. *Addiction*. 2003; 98(12):1661–1672. doi:10.1111/j.1360-0443.2003.00545.x. [PubMed: 14651495]
- Torrubia R, Ávila C, Moltó J, Caseras X. The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences*. 2001; 31(6):837–862. doi:10.1016/S0191-8869(00)00183-5.
- Vangsness L, Bry BH, LaBouvie EW. Impulsivity, negative expectancies, and marijuana use: A test of the acquired preparedness model. *Addictive Behaviors*. 2005; 30(5):1071–1076. doi:10.1016/j.addbeh.2004.11.003. [PubMed: 15893107]
- Wardell JD, Read JP, Colder CR, Merrill JE. Positive alcohol expectancies mediate the influence of the behavioral activation system on alcohol use: A prospective path analysis. *Addictive Behaviors*. 2012; 37(4):435–443. doi:10.1016/j.addbeh.2011.12.004. [PubMed: 22209025]
- Weinstock J, Whelan JP, Meyers A. College students' gambling behavior: When does it become harmful?. *Journal of American College Health*. 2008; 56(5):513–521. doi:10.3200/JACH.56.5.513-522. [PubMed: 18400663]
- Whiteside SP, Lynam DR, Miller JD, Reynolds SK. Validation of the UPPS impulsive behaviour scale: A four-factor model of impulsivity. *European Journal of Personality*. 2005; 19(7):559–574. doi:10.1002/per.556.
- Wickwire EM, Whelan JP, Meyers AW. Outcome expectancies and gambling behavior among urban adolescents. *Psychology of Addictive Behaviors*. 2010; 24(1):75–88. doi:10.1037/a0017505. [PubMed: 20307114]
- Yuan K, Bentler PM, Zhang W. The Effect of Skewness and Kurtosis on Mean and Covariance Structure Analysis: The Univariate Case and Its Multivariate Implication. *Sociological Methods & Research*. 2005; 34(2):240–258. doi:10.1177/0049124105280200.
- Zuckerman M. Item revisions in the Sensation Seeking Scale Form V (SSS-V). *Personality and Individual Differences*. 1996; 20(4) doi:10.1016/0191-8869(95)00195-6.

Zuckerman M, Eysenck SB, Eysenck HJ. Sensation seeking in England and America: Cross-cultural, age, and sex comparisons. *Journal of Consulting and Clinical Psychology*. 1978; 46(1):139–149. doi:10.1037/0022-006X.46.1.139. [PubMed: 627648]

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Figure 1. Acquired Preparedness Model for Gambling Frequency

The reduced model of the relationship between impulsivity domains, gambling outcome expectancies, and gambling frequency. Unstandardized parameter estimates are presented.

Note: * p < .05, ** p < .01.

Figure 2. Acquired Preparedness Model for Gambling Symptomatology

The reduced model of the relationship between impulsivity domains, gambling outcome expectancies, and gambling symptomatology. Unstandardized parameter estimates are presented. Note: * p < .05, ** p < .01.

Table 1

Total Indirect and Specific Indirect Effects for Predicting Gambling Frequency

Impulsivity Dimension	Gambling Outcome Expectancy	Indirect Effect		Standard Error
		Total	Specific	
Behavioral activation		−0.74 ^{**}		0.13
	Affect		−0.74 ^{**}	0.07
	Self-evaluation		0.15 [*]	0.22
	Social consequences		−1.03 [*]	0.04
	Material Gain/Loss		0.08	0.07
	Parental disapproval		0.01	0.04
Preference for stimulation		0.94 ^{**}		0.12
	Affect		0.94 ^{**}	0.14
	Self-evaluation		−0.31 [*]	0.28
	Social consequences		1.38 ^{**}	0.03
	Material Gain/Loss		−0.02	0.14
	Parental disapproval		−0.02	0.07
Inhibition Control		−0.55 ^{**}		
	Affect		0.15	0.12
	Self-evaluation		−0.86 ^{**}	0.08
	Social consequences		0.11 [*]	0.22
	Material Gain/Loss		0.01	0.05
	Parental disapproval		0.05	0.06

Note:

*
 $p < .05$ **
 $p < .001$

Table 2

Total Indirect and Specific Indirect Effects for Predicting Gambling Symptomatology

Impulsivity Dimension	Gambling Outcome Expectancy	Indirect Effect		Standard Error
		Total	Specific	
Behavioral activation		−0.07 **		0.02
	Affect		0.01	0.02
	Self-evaluation		−0.10 **	0.03
	Social consequences		0.01	0.01
	Material Gain/Loss		0.02	0.02
	Parental disapproval		0.01	0.01
Preference for stimulation		0.12 *		0.04
	Affect		0.03	0.04
	Self-evaluation		0.17 *	0.04
	Social consequences		−0.01	0.01
	Material Gain/Loss		−0.05	0.05
	Parental disapproval		−0.02	0.02
Inhibition Control		−0.09 **		0.03
	Affect		−0.01	0.02
	Self-evaluation		−0.13 **	0.04
	Social consequences		0.01	0.01
	Material Gain/Loss		0.03	0.03
	Parental disapproval		0.01	0.02

Note:

*
 $p < .05$ **
 $p < .001$