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Relations of Five-Factor Personality Domains to Gambling Motives in Emerging Adult Gamblers: A Longitudinal Study

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Abstract

At least three types of gambling motives have been proposed: coping motives (gambling to reduce negative affect), enhancement motives (gambling to enhance positive affect), and social motives (gambling to increase social affiliation). Few studies have examined the underlying personality traits that give rise to these different motivations. The present study tests the longitudinal link between changes in five-factor model personality domains and gambling motives among emerging adults. A sample of 679 emerging adults (M_{age} = 18.90 years; 51.8% female) was recruited as part of the Manitoba Longitudinal Study of Young Adults (MLSYA). Participants completed self-report questionnaires across four measurement occasions, with each measurement 12–18 months apart. The NEO Five Factor Inventory was administered at waves 1 and 3, and the Gambling Motives Questionnaire was administered at wave 4. Data were analyzed using longitudinal structural equation modeling. Emerging adults who experienced increases in neuroticism had higher coping motives at a subsequent wave. Those who experienced increases in extraversion had higher enhancement and social motives. Those who experienced increases in agreeableness had lower social and coping motives. Changes in conscientiousness and openness were unrelated to any of the motives after controlling for all other variables. Extraversion and agreeableness predicting social motives were the most robust findings. A multigroup analysis showed the measurement and structural models did not differ by sex. Longitudinal changes in five-factor model personality domains were linked to specific motives for gambling in a theoretically-expected fashion. Results have implications for personality-targeted interventions for problem gamblers.

Keywords: personality, motivation, gambling, longitudinal, emerging adulthood

Résumé

Au moins trois types de motivations au jeu ont été proposées : l'adaptation (jouer pour atténuer une émotion négative), la stimulation (jouer pour stimuler une émotion positive) et les rapports sociaux (jouer pour accroître ses liens sociaux). Peu d'études ont examiné les traits de personnalité associés à ces différentes motivations. La présente étude met à l'épreuve le lien longitudinal entre des changements touchant les domaines de la personnalité (selon un modèle à cinq facteurs NEO Pi-R) et les motivations au jeu chez les jeunes adultes. Un échantillon de 679 jeunes adultes ($M_{âge}$ = 18,9 ans; 51,8 % de femmes) a été recruté dans le cadre d'une étude longitudinale sur les jeunes adultes du Manitoba (Manitoba Longitudinal Study of Young Adults [MLSYA]). Les participants ont rempli des questionnaires d'auto-évaluation lors de quatre séances de mesure espacées d'un intervalle de 12 à 18 mois entre chacune. Le test de personnalité à cinq facteurs NEO Pi-R a été administré aux participants pendant les séances 1 et 3, et ceux-ci ont répondu au questionnaire sur les motivations au jeu lors de la séance 4. Les données ont été analysées au moyen d'une modélisation par équation structurelle longitudinale. Chez les jeunes adultes dont la personnalité a connu un accroissement du domaine du névrosisme, les motivations relevant de l'adaptation étaient également plus élevées. Ceux chez qui le domaine de l'extraversion s'est accru, les motivations étaient de l'ordre de la stimulation et de la recherche de rapports sociaux, alors que ceux pour qui le domaine de l'agréabilité a augmenté, les motivations relevant de l'adaptation et de la recherche de rapports sociaux étaient moins importantes. Des changements dans les domaines de la conscience et de l'ouverture n'étaient associés à aucun type de motivation, après un rajustement pour toutes les autres variables. La constatation la plus robuste de l'étude consiste dans le fait que les domaines de l'extraversion et de l'agréabilité sont des variables explicatives des motivations d'ordre social. Une analyse de groupes multiples a montré que les mesures et les modèles structuraux ne donnaient lieu à aucune différence quant au sexe. Il existe un lien entre les changements longitudinaux touchant les domaines de la personnalité du modèle à cinq facteurs NEO Pi-R et les motivations propres au jeu, conformément à ce que prévoyait la théorie. Ces résultats ont une incidence sur les interventions auprès des joueurs à problèmes axées sur la personnalité.

Introduction

Affect plays a central role in the etiology of problem gambling. Theory and research (Milosevic & Ledgerwood, 2010; Stewart, Zack, Collins, Klein, & Fragopoulos, 2008) both suggest a subset of problem gamblers suffer from heightened negative affect, and are then motivated to gamble as a means of relieving that negative affect. Other gamblers are predominantly approach-oriented, and gamble to heighten their positive emotions and arousal. Though some gamblers are motivated for non-affective reasons, such individuals tend to have fewer gambling problems overall (Stewart & Zack, 2008). Despite excellent work on subtyping the personality of problem gamblers, few scholars have thus far explored the link between personality and gambling motives (cf., MacLaren, Ellery, & Knoll, 2015), and virtually no studies have used longitudinal methods to establish temporal precedence and help to infer causality. Such relationships have been shown to play a central role in the case of other addictive behaviors, such as alcohol use (Cooper, Kuntsche, Levitt, Barber, & Wolf, 2015); thus, elucidating the longitudinal relationship between personality and gambling motivations may be important to understand better both the etiology and course of problem gambling. The present study tests the longitudinal link between personality change and gambling motives in a representative sample of emerging adult gamblers.

The Five Factor Model and pathological gambling

The five-factor model (FFM) (Costa & McCrae, 1992; Digman, 1990) suggests human personality comprises five higher-order, trait-like dimensions or "domains": (a) *neuroticism* (a tendency to experience negative affect); (b) *extraversion* (a tendency to experience positive affect); (c) *openness* (a tendency to be reflective, imaginative, and intellectually curious); (d) *agreeableness* (a tendency to be friendly, trustworthy, and prosocial); and (e) *conscientiousness* (a tendency to be self-disciplined, organized, and constrain immediate impulses in favor of long-term goals).

A meta-analysis of 44 studies (N = 7455) found that pathological gamblers were lower in conscientiousness and agreeableness, higher on neuroticism, and had roughly the same levels of extraversion compared to healthy controls (MacLaren, Fugelsang, Harrigan, & Dixon, 2011b). This meta-analysis provides an important summary of personality differences between treatment-seeking problem gamblers and healthy controls. However, studies included in this meta-analysis are limited by selection bias. For example, persons seeking treatment for mental disorders tend to be higher in neuroticism and lower in both conscientiousness and extraversion (Goodwin, Hoven, Lyons, & Stein, 2002). Moreover, gamblers seeking treatment may represent only a small proportion of problem gamblers, as most problem gamblers do not seek treatment (Slutske, 2006). Beyond this, the hierarchical structure of personality (Markon, Kruger, & Watson, 2005) means that personality domains in the FFM are not fully orthogonal. Multiple regression might help tease apart the unique contributions of the FFM components when predicting gambling beyond what was shown in MacLaren et al. (2011b). Finally, though there is not necessarily a strong theoretical rationale for its inclusion, MacLaren et al.'s (2011b) meta-analysis did not examine openness, which is a potential limitation in method.

A mixed pattern of results has been found using community and student samples when all FFM domains have been entered as simultaneous predictors of gambling outcomes. Buckle, Dwyer, Duffy, Brown, and Pickett (2013) found that openness and agreeableness were negatively correlated with problem gambling in a university student sample. In a sample of undergraduates, MacLaren, Best, Dixon, and Harrigan (2011a) determined that the impulsivity facet of neuroticism was positively associated with gambling problems, whereas facets of agreeableness and conscientiousness were instead negatively associated with gambling problems. In a community sample, Miller et al. (2013) established that only high neuroticism and low openness predicted gambling problems after controlling for other FFM personality domains. Thus, when all five personality domain scores are entered simultaneously to predict gambling outcomes in community and student samples, the pattern of results appears less clear than in designs comparing treatment-seeking problem gamblers to healthy controls (MacLaren et al., 2011b).

Gambling motives and pathological gambling

In addition to personality traits, certain motivations for gambling appear characteristic of pathological gamblers. Drawing on theory from the drinking-motives literature (Cooper, Frone, Russell, & Mudar, 1995), Stewart et al. (2008) proposed three motives for gambling. In this model, people can gamble to enhance positive emotions (enhancement motives), to inhibit negative emotions (coping motives), or to increase social affiliation (social motives) (Stewart & Zack, 2008; Stewart et al., 2008). Similar three-cluster models have been proposed and supported with latent profile analysis by other research groups (Nower, Martins, Lin, & Blanco, 2013).

Individual differences in gambling motives have been shown to predict gambling outcomes. Coping and enhancement motives, rather than social motives, appear to be characteristic of pathological gamblers (McGrath, Stewart, Klein, & Barrett, 2010; Stewart & Zack, 2008). Coping-motivated gamblers also display greater severity of gambling problems than other subtypes, and enhancement motivated gamblers display greater intensity and frequency of gambling behavior than those who are socially motivated (Stewart et al., 2008). Thus, coping and enhancement motives—both affect-laden or "internal" motives—appear to have the strongest relationship with adverse gambling outcomes, including pathological gambling.

Personality and gambling motives

Despite a robust literature on personality predicting problem gambling, few scholars have examined the link between personality and gambling motives. According to Cooper's theory, specific antecedent personality factors should be linked to specific motives for substance use (Cooper et al., 2015). Specifically, Cooper et al.'s (2015) review suggests neuroticism is positively associated with coping motives, extraversion is positively associated with enhancement motives, and conscientiousness is negatively related to all motives. A few studies have supported this contention. Sztainert, Wohl, McManus, and Stead (2014) found, in a sample of pathological gamblers, that reward sensitivity (i.e., a personality trait representing a tendency to seek out positive reinforcement) predicted both enhancement and social gambling motives, but did not predict coping motives. Using a 30-day experience sampling design, Goldstein, Stewart, Hoaken, and Flett (2014), in a sample of at-risk gamblers, determined that negative affectivity was positively correlated with coping motives, positive affectivity was positively related to enhancement motives, and impulsivity was positively related to both coping and enhancement motives. Using a sample of frequent electronic gambling machine players, MacLaren et al. (2015) discovered that low industriousness had an indirect effect on problem gambling through coping motives. When inspecting the bivariate correlations, neuroticism was related to coping motives, conscientiousness was related to both coping and enhancement motives, and agreeableness and extraversion were unrelated to gambling motives (openness was not examined). Thus, preliminary evidence supports the notion that specific FFM domains predict theoretically-relevant motivations for gambling, in a similar way to research on substance use motives (Cooper et al., 2015).

Given the well-known links between neuroticism and psychopathology, studies linking psychopathology to coping motives are consequently also informative. Ledgerwood and Milosevic (2015) found participants with post-traumatic stress disorder are more likely to gamble to cope with their negative emotions. Similarly, participants with a current mood disorder tended to endorse more coping motives for gambling compared to participants without a mood disorder (Lister, Milosevic, & Ledgerwood, 2015).

Rationale and the present study

Though much research has examined the link between personality and problem gambling in treatment-seeking (MacLaren et al., 2011b) and university student samples (Buckle et al., 2013), few studies have examined the relationship in community emerging adults. Such tests are important to ensure that relationships between personality and problem gambling are not due to selection bias. Prior research has also tended to exclude the openness domain of the FFM. Though a few studies have tested the link between FFM personality and gambling motives (MacLaren et al., 2015), these studies have relied on cross-sectional methods, which makes causal inference difficult. Though FFM personality domains exhibit substantial stability, these domains can also change over time, especially during emerging adulthood (Robins, Fraley, Roberts, & Trzesniewski, 2001). More importantly, changes in FFM personality domains can predict co-occurring changes in addictive behaviours as well. For instance, Littlefield, Sher, and Wood (2010) found that increases in conscientiousness and decreases in neuroticism were linked to decreases in alcohol problems from ages 21–35. Thus, a stronger test would be whether the *changes* in personality that occur in emerging adulthood are associated with future gambling motives. More specifically, we tested whether increases and decreases in certain personality domains would predict specific, theoretically-relevant gambling motives at a later time point. Finally, most past studies have used Ordinary Least Squares regression to test hypotheses; however, structural equation modelling represents an improvement upon these statistical methods by reducing measurement error through the use of latent variables (Kline, 2011). The present study addresses these gaps by using a longitudinal design with a community sample of emerging adult gamblers analyzed using structural equation modelling.

Hypotheses

We hypothesized that changes in certain FFM personality domains would lead to certain gambling motives at a future wave. Specifically, we hypothesized that: (H1) increases in neuroticism would be positively related to coping motives at a later wave; (H2) increases in extraversion would be positively related to social and enhancement motives; (H3) increases in conscientiousness would be negatively related to all motives; (H4) increases in agreeableness would be negatively related to all motives; and (H5) increases in openness would be unrelated to all gambling motives. Finally, because certain studies have found interactions between sex and personality when predicting gambling (Buckle et al., 2013), and because men tend to have more gambling problems than women (Slutske, 2006), we explored one open-ended research question: (RQ1) do the factor loadings or paths tested in H1-H5 differ by sex?

Method

Participants

Participants in MLSYA (MGCC, 2011) were recruited via a variety of methods, including random-digit dialing, participant referrals, survey recruiting, placing advertisements at video lottery terminal (VLT) sites and post-secondary institutions, and casino recruiting. To participate, individuals were required to be 18-20 years old at wave 1, and consent to repeated contact over a five-year period. Wave 1 consisted of 679 participants (51.8% female, mean age = 18.90 years, SD = 0.79), with high retention rates five years later (70.9%; N = 530). A minority of participants reported that they were past-year non-gamblers at wave 1 (N = 78), wave 2 (N = 57), wave 3 (N = 49), and wave 4 (N = 43). There were no significant differences (ps $>$ .05) between gamblers and non-gamblers in terms of personality (ds ranging from -.08 to .08). Wave 4 non-gamblers were removed for the current study, as they could not have gambling motives. Thus, Wave 4 consisted of 487 emerging adult gamblers (52.6% female; mean age = 22.20 years, SD = 0.91). These participants reported spending an average of \$671.60 (SD = \$1,602.35), gambled an average of 28.42 days (SD = 51.51), and spent an average of 25.05 hours (SD = 79.14) gambling in the past year. Moreover, 15.0% of participants reported one or more gambling problems on the Problem Gambling Severity Index (Wynne 2003).[1]

[1]Relationships between gambling motives, gambling behaviours, and problem gambling using this data set are presented in Lambe, Mackinnon, and Stewart (2015b). They found that all three gambling motives subscales were positively correlated with gambling behaviours and problem gambling; however, only enhancement motives emerged as a significant predictor of gambling problems when the other motives and gambling behaviours were entered as simultaneous predictors. Results for gambling behaviours and problems are not presented in this paper to avoid duplication.

Measures

NEO Five Factor Inventory (NEO-FFI). The NEO-FFI (Costa & McCrae, 1992) is a standardized 60-item measure tapping the five domains of the FFM: (1) extraversion, (2) neuroticism, (3) openness, (4) agreeableness, and (5) conscientiousness. Each domain scale consists of 12 Likert questionnaire items on which participants respond from 0 (strongly disagree) to 4 (strongly agree). Missing responses were replaced by a score of 2 (neutral) as per instructions by the instrument's authors. Cases with $\geqslant$10 invalid responses were excluded (n = 3 at wave 1; n = 1 at wave 3). In samples of emerging adults, the NEO-FFI showed high test-retest reliability over a two-week interval (rs=.86-.90) and acceptable internal consistency (αs=.75-.85, Robins et al., 2001). Over longer time intervals (e.g., 4 years), mean-levels of neuroticism and agreeableness exhibited the largest degree of change in this population (Robins et al., 2001).

Gambling Motives Questionnaire – Short Form (GMQ – Short Form). The GMQ – Short Form (Lambe et al., 2015b) is a modified 9-item measure of the original GMQ (Stewart & Zack, 2008). The GMQ assesses three dimensions of motives: (1) enhancement ("because it's exciting"), (2) social ("as a way to celebrate"), and (3) coping ("to forget your worries"). Participants respond to each of the items on a 1 (*almost never/never*) to 4 (*almost always*) Likert scale. The GMQ – Short Form has been validated as a measure of gambling motives in emerging adults, with factorial validity supporting the 3-factor model and alpha reliabilities $\geqslant$ .78 for all three subscales in the present sample (Lambe et al., 2015b).

Procedure

The MLSYA was a five-year longitudinal study that collected data from emerging adults in Manitoba. All participants gave informed consent. During each wave, participants were initially contacted by telephone to complete a telephone interview that included both closed- and open-ended questions. This was followed by a questionnaire battery that participants had the option of completing online (97.9%) or through a mail-in questionnaire (2.1%), both of which included the same measures in the same order. Four waves of data collection occurred, at approximately 12-18 month intervals. Archival data provided by the MLSYA was used for the current study. The NEO-FFI was administered only at waves 1 and 3. The GMQ was administered only at wave 4.

Data analytic strategy

Hypotheses were tested using structural equation modeling in Mplus 7.3 software. A robust estimate of fit indices and standard errors (MLR estimation) was used to account for minor deviations from multivariate normality. A full information maximum likelihood approach was used to handle missing data. Model fit was assessed using multiple fit indices. A root-mean-square error of approximation (RMSEA) and a standardized root mean square residual (SRMR) below .05 indicated excellent fit and values below .08 represented adequate fit. Moreover, a comparative fit index (CFI) and Tucker-Lewis Index (TLI) over .95 indicated excellent fit, and values over .90 indicated adequate fit (Hu & Bentler, 1999; Kline, 2011).

Analysis proceeded in three steps: a (a) measurement model, (b) structural model, and (c) multigroup model split by sex. Before running the measurement model, the NEO-FFI subscales were first split into three item parcels per subscale, with each parcel consisting of four randomly selected items, following procedures from Little, Cunningham, Shahar, and Widaman (2002). Item parcels (three parcels for each latent variable) were used as observed indicators of latent variables for the NEO-FFI. Because the short-form subscales of the GMQ consist of three items, the individual items were used as observed indicators of gambling motives latent variables. Due to the longitudinal nature of the data, residuals of observed indicators were correlated across waves for the personality variables (e.g., wave 1 neuroticism parcel 1 with wave 3 neuroticism parcel 1). After assessing the fit of the measurement model, we then proceeded to the structural model by entering paths and correlations as depicted in Figure 1. Finally, we ran a multigroup model testing for invariance across sex. In this model, we tested for configural (i.e., same factor structure), metric

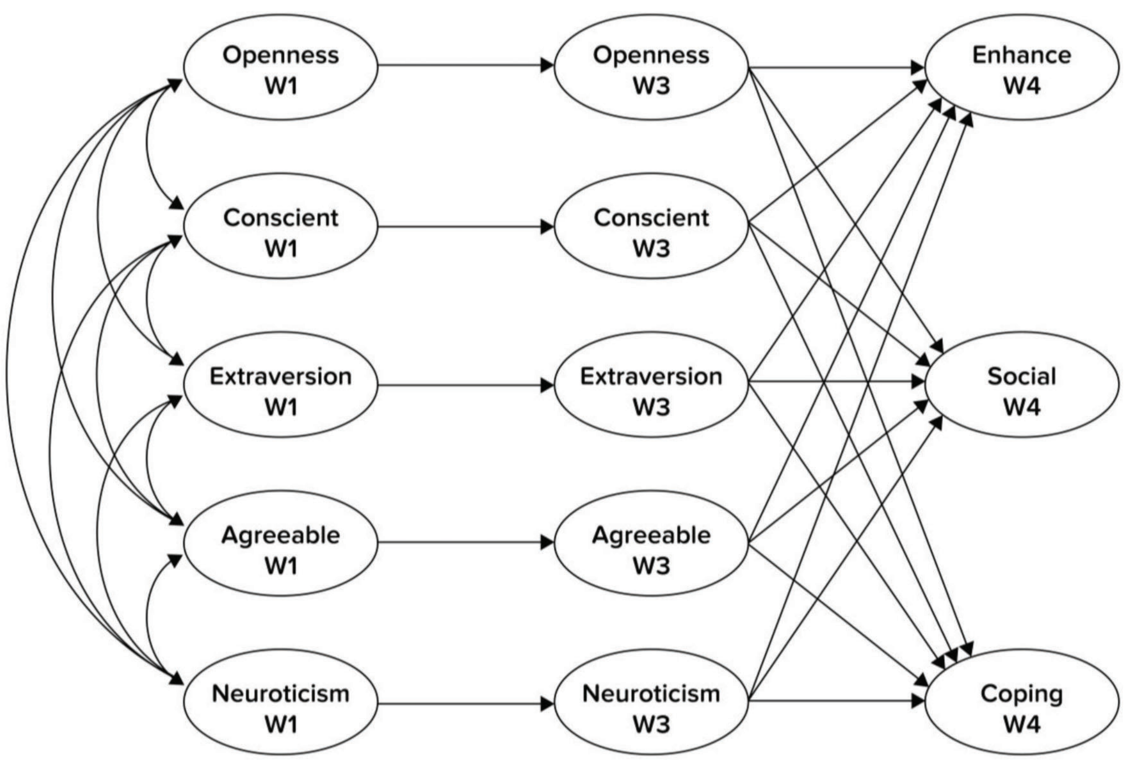

Figure 1. Structural equation model. Latent variables were created using item parceling for personality variables, and individual items for gambling motives. Residuals on item parcels were correlated across waves (observed indicators of latent variables not shown for clarity). Conscient = Conscientiousness; Agreeable = Agreeableness.

(i.e., same magnitude of factor loadings), and scalar invariance (i.e., same intercepts) of the factor structure (Wu, Li, & Zumbo, 2007). As well, we tested for invariance across sex for all structural paths and correlations in Figure 1 by comparing a model with all paths and correlations freely estimated, to a model with paths and correlations constrained across sex. When comparing nested models in these multigroup comparisons, we used ΔCFI of |.01| as our critical value for determining differences in model fit (Cheung & Rensvold, 2002).

Results

Descriptive Statistics

Means, standard deviations, internal consistencies, and bivariate correlations are presented in Table 1. Overall, means and standard deviations were similar to previously published means (Robins et al., 2001; Stewart & Zack, 2008). Internal consistencies ranged from .70 to .87, suggesting adequate reliability. Test-retest correlations for personality domain measures (*r*s from .56 to .69) suggest substantial stability over time, but correlations were not so large as to preclude longitudinal analysis. Generally speaking, personality variables tended to be inconsistently correlated with outcomes in the bivariate correlations. However, because the FFM personality variables overlapped substantially (*r*s from -.37 to .40) and the gambling motives were also strongly intercorrelated (*r*s from .35 to .56), subsequent structural equation modeling where this overlap was partialed out was likely to prove more informative than relying on bivariate correlations.

Measurement Model

The measurement model fit well, $\chi^2(609, N = 678) = 1228.48$, $p < .001$; CFI = .94; TLI = .92; RMSEA = .04, SRMR = .05, and the standardized factor loadings ranged from .59 to .88. Together, these results support the factor structure of the measured constructs, and support moving forward with the structural model.

Structural Model

The structural model also fit well, $\chi^2(644, N = 678) = 1276.12$, $p < .001$; CFI = .93; TLI = .92; RMSEA = .04, SRMR = .05. The FFM personality traits all exhibited strong stability from Wave 1 to Wave 3 (βs from .62 to .87); however, substantial residual variance remained for use as a predictor of gambling motives in the full structural model. After partialing out Wave 1 personality, we examined whether wave 3 personality traits predicted wave 4 gambling motives. In this way, we examined whether rank-order changes in personality traits from wave 1 to wave 3 predicted gambling motives at a subsequent wave. Overall, we found that: (a) increases in extraversion predicted greater social motives at a subsequent wave, and (b) decreases in agreeableness predicted greater social motives. In the context of the full structural model, none of the other personality variables significantly

Table 1

Bivariate correlations, descriptive statistics, and internal consistency

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. W1 Openness													
2. W1 Conscientiousness	-.04												
3. W1 Extraversion	.13**	.27**											
4. W1 Agreeableness	.15**	.27**	.31**										
5. W1 Neuroticism	.00	-.27**	-.36**	-.31**									
6. W3 Openness	.75**	-.08	.07	.15**	-.01								
7. W3 Conscientiousness	.04	.65**	.21**	.24**	-.21**	-.02							
8. W3 Extraversion	.12*	.17**	.69**	.29**	-.25**	.12**	.30**						
9. W3 Agreeableness	.15**	.23**	.25**	.73**	-.17**	.17**	.35**	.40**					
10. W3 Neuroticism	.07	-.20**	-.26**	-.18**	.56**	.03	-.36**	-.37**	-.29**				
11. W4 Enhancement	-.02	-.10*	-.03	-.12**	.14**	-.02	-.13**	.00	-.13**	.13**			
12. W4 Social	-.06	-.03	.06	-.10*	-.02	-.04	-.02	.14**	-.11*	-.01	.47**		
13. W4 Coping	-.04	-.05	-.02	-.13**	.07	-.06	-.12*	-.07	-.17**	.16**	.56**	.35**	
Mean	3.36	3.51	3.54	3.58	2.75	3.39	3.61	3.52	3.63	2.68	1.35	1.57	1.12
SD	0.50	0.51	0.48	0.53	0.65	0.49	0.50	0.50	0.51	0.66	0.55	0.63	0.32
A	.70	.81	.75	.78	.84	.73	.81	.79	.79	.87	.80	.78	.79

Note. Listwise deletion $N = 451$.
$*p < .05$, $**p < .01$

Table 2
Unstandardized and standardized path coefficients from structural model

Predictor	B	SE B	β	*p-value*
Predicting Wave 3 Personality (Test-Retest Stability)				
W1 Conscientiousness	0.70	0.05	.73	$<$ .001**
W1 Extraversion	0.86	0.07	.78	$<$ .001**
W1 Neuroticism	0.64	0.05	.62	$<$ .001**
W1 Agreeableness	0.83	0.05	.80	$<$ .001**
W1 Openness	0.88	0.06	.87	$<$ .001**
Predicting Enhancement Motives				
W3 Conscientiousness	-0.15	0.10	-.12	.134
W3 Extraversion	0.27	0.13	.18	.045*
W3 Neuroticism	0.13	0.07	.15	.056
W3 Agreeableness	-0.17	0.10	-.15	.091
W3 Openness	-0.03	0.08	-.03	.709
Predicting Social Motives				
W3 Conscientiousness	-0.04	0.08	-.03	.642
W3 Extraversion	0.41	0.10	.31	$<$ .001**
W3 Neuroticism	0.01	0.05	.02	.803
W3 Agreeableness	-0.24	0.08	-.25	.002**
W3 Openness	-0.06	0.06	-.06	.347
Predicting Coping Motives				
W3 Conscientiousness	-0.05	0.05	-.07	.285
W3 Extraversion	0.07	0.05	.09	.164
W3 Neuroticism	0.06	0.03	.14	.034*
W3 Agreeableness	-0.09	0.04	-.16	.024*
W3 Openness	-0.05	0.04	-.09	.173

*$p < .05$, **$p < .003$ (i.e., a Bonferroni correction)

predicted gambling motives at $p < .003$ (i.e., after a Bonferroni correction). However, certain findings were statistically significant using a less stringent criterion of $p < .05$: (c) increases in neuroticism predicted coping motives; (d) increases in extraversion predicted greater enhancement motives; and (e) decreases in agreeableness predicted greater coping motives. Path coefficients and exact *p*-values are presented in Table 2. R^2 values were as follows: W3 openness (.76), W3 conscientiousness (.54), W3 extraversion (.60), W3 agreeableness (.65), W3 neuroticism (.39), W4 enhancement motives (.07), W4 social motives (.09), W4 coping motives (.07).[2]

[2]Given that item-parcelling is a somewhat controversial technique, we re-analyzed the data using Exploratory Structural Equation Modelling (ESEM), as recommended by Marsh, Lüdtke, Nagengast, Morrin, & Von Davier (2013). The following paths became non-significant ($p > .05$) in the ESEM analyses: (a) extraversion positively predicting enhancement motives, and (b) neuroticism positively predicting coping motives. The patterns of statistical significance for all other paths remained the same at $p < .05$. Please see Supplementary Material for a full presentation of these results.

Multigroup Model by Sex

We next explored potential sex differences by using multigroup analysis. Overall, the model fit well for the configural (CFI = .926), metric (CFI = .927), and scalar (CFI = .920) invariance models where the factor structure was constrained to equality across sex. Since the ΔCFI was not greater than .01, the factor structure was invariant across sex, supporting the decision to move forward with structural constraints. When a model with paths and correlations freely estimated, was compared to a model where the paths and correlations were constrained to equality, the models fit equally well (ΔCFI = .001). Thus, there were no observed sex differences in the factor structure or the magnitude of paths in the model.

Discussion

Overall, hypotheses received mixed support. The most robust findings pertained to the prediction of social motives. Emerging adult gamblers who experienced increases in extraversion and decreases in agreeableness were motivated to gamble socially. Weaker effects were found for coping motives, with increases in neuroticism and decreases in agreeableness predicting future coping motives. Increases in extraversion were weakly associated with future enhancement motives. However, findings regarding enhancement and coping motives tended to vary depending on the data analytic strategy used, thereby reducing confidence in those results.

Neuroticism

Results using item-parceling suggested that, as hypothesized, emerging adult gamblers who experienced increases in neuroticism were motivated to cope with those increases by gambling. However, this finding did not persist when analyzed using ESEM or when applying Bonferroni corrections. Thus, there is only weak evidence to support H1. Nonetheless, this finding is consistent with prior research showing negative affectivity predicts gambling motives when averaged across 30 days (Goldstein et al., 2014) and mirrors longitudinal findings for personality and drinking motives (Mackinnon, Kehayes, Clark, Sherry, & Stewart, 2014). This finding is also consistent with prior research suggesting a demoralized or avoidance-oriented subtype of gambler exists, one who experiences heightened negative affect, and who gambles as a way to escape those negative emotions (Blaszczynski & Nower, 2002; Milosevic & Ledgerwood, 2010; Stewart et al., 2008; Vachon & Bagby, 2009). Given the inconsistencies that emerge when data are analyzed using different approaches, future replication is advised before interpreting this effect further. Likely, the longitudinal contribution of neuroticism to coping motives is small in magnitude.

Extraversion

Increases in extraversion were positively associated with future enhancement motives, as hypothesized. As this relationship did not persist when analyzed using ESEM or applying a Bonferroni correction, this component of H2 also received weak support. Nonetheless, the specificity of this relationship tentatively supports the notion of a hedonic or approach-oriented subtype of gambler (Milosevic & Ledgerwood, 2010; Stewart et al., 2008; Vachon & Bagby, 2009). This finding is also consistent with Goldstein et al.'s (2014) daily diary study, which determined a positive association between positive affectivity and enhancement motives. Given that this finding did not persist when the data analytic strategy was changed, we have decreased confidence in the robustness of this discovery. Indeed, given that MacLaren et al. (2011b) found a null relationship between extraversion and problem gambling, the existence of this effect more broadly in the general population remains uncertain. This relationship might be clarified by examining more fine-grained facets of extraversion. For instance, MacLaren et al. (2011a) ascertained that the positive emotions facet of extraversion is associated with fewer gambling problems, while Sztainert et al. (2014) found that reward sensitivity was associated with heightened enhancement motives and gambling problems. Future research might explore these relationships longitudinally to isolate the components of extraverted personality associated with specific patterns of gambling motives.

A more robust relationship was found between extraversion and social motives, supporting H2. Extraversion represents a tendency to experience and seek out positive emotions (Digman, 1990); thus, adolescents who experience increasing levels of extraversion are experiencing heightened positive affect, more social affiliation, and presumably greater psychological adjustment. Social motives are typically considered to be a healthier, non-pathological form of gambling motivation (Stewart & Zack, 2008). It appears then, that a pattern of increasing extraversion during emerging adulthood predicts healthy gambling motivations that are unlikely to place that person at risk for gambling problems. This contention is supported by other analyses using this data set (Lambe et al., 2015b). When all three motives were entered in as simultaneous predictors of gambling behaviours and problems, Lambe et al. (2015b) found that social motives were positively related to time spent gambling, but unrelated to money spent or gambling problems. In contrast, enhancement motives were associated with increased time spent gambling, money spent, and associated gambling problems. Overall, a pattern of increasing extraversion in emerging adulthood may represent a relatively healthy pattern of development, at least as it pertains to gambling risk.

Conscientiousness and Agreeableness

Changes in conscientiousness were unrelated to all motives after controlling for other FFM variables, failing to support H3. In contrast, increases in agreeableness were most strongly related to social motives, less robustly related to coping motives, and unrelated to enhancement motives, partially supporting H4. Though conscientiousness and agreeableness are considered separate in the FFM, Markon et al. (2006) demonstrated they both comprise a higher order "disinhibition" factor. When both disinhibited personality domain scores were entered longitudinally as predictors with other personality traits and motives, only change in agreeableness emerged as a more generalized predictor of gambling motives. The present data thus do not suggest that conscientiousness is unrelated to gambling motives, but rather, that the proportion of the variance in conscientiousness that changes over time and is unique relative to the other variables (including agreeableness) does not predict gambling motives.

Results suggest unique features of disinhibited social behaviors may promote general motivations to gamble. For instance, disagreeable behavior might lead to relationship conflict, which in turn would lead to gambling to cope—a link observed in the drinking-motives literature (Lambe et al., 2015a). Moreover, the lack of specificity of the relationship (i.e., relations to both coping and social motives) suggests decreases in agreeableness confer risk for a more generalized, opportunistic set of motives, consistent with research on impulsivity and drinking motives (Mackinnon et al., 2014). Overall, disinhibited personality predicted gambling motives, to some degree, with the largest effect emerging for disagreeable personality predicting social motives.

Openness to Experience

Openness to experience remains something of an anomaly in the study of gambling, no theory exists to explain its link to problem gambling. For instance, MacLaren et al. (2011b) excluded it from their meta-analysis on problem gambling on theoretical grounds. However, low openness has sometimes been linked to problem gambling in prior research (Buckle et al., 2013; Miller et al., 2013), suggesting it may have a role to play when understanding gambling behaviors. Though the present data suggest openness is unrelated to gambling motives, certain facets of openness (e.g., willingness to experiment) might be related to problem gambling, and, to help resolve inconsistent findings, are worth exploring in greater detail in future research. Future qualitative research might explore the underlying motives for gambling in this personality type if consistent links to problem gambling are found for people low in openness.

Limitations and future directions

The present study has limitations. Ideally, we would control for levels of gambling motives at a prior wave using a full cross-lagged panel design (Cole & Maxwell, 2003). However, gambling motives were measured only at Wave 4, and personality only at Waves 1 and 3 in MLSYA. Thus, the present analytic strategy could not assess changes in gambling motives over time. Though longitudinal studies have advantages over cross-sectional research, no longitudinal study can strictly infer causality because of the possibility of third variable mechanisms. For instance, it is possible that the link between neuroticism and coping motives might be because of a co-morbid depressive disorder (Lister et al., 2015). Our use of item parceling is somewhat controversial, with arguments both for and against its use for modelling the five-factor personality traits in structural equation models (Herrmann & Pfister, 2013; Little et al., 2002; Marsh et al., 2013). More importantly, certain theoretically-predicted findings (i.e., neuroticism predicting coping, extraversion predicting enhancement) were not statistically significant when the data analytic strategy was changed to utilize ESEM or when Bonferroni corrections were applied. Thus, further studies are required to verify these less-robust findings. The present study was also conducted with a relatively homogenous sample of emerging adults from a single Canadian province, and the results may not be generalizable to older or younger samples. Given that changes in personality are most common in emerging adulthood (Robins et al., 2001), it is possible that the current findings are unique to this age range. Moreover, these relationships may vary across different cultures or ethnicities. Finally, the NEO-FFI was designed to be a relatively brief measure of the FFM constructs and as such, taps higher-order personality domains, but not lower-order facets. Thus, more longitudinal research is needed to examine which facets are linked to specific emotion-regulation gambling motives (MacLaren et al., 2011a).

Clinical Implications and Conclusions

Overall, longitudinal changes in personality were linked to specific gambling motives in a theoretically-expected way, though the strongest findings involved the prediction of social motives. Prior research using this data set (Lambe et al., 2015b), and in other samples (Stewart & Zack, 2008) has found that social motives are generally unrelated to problem gambling, and that social motives are a healthier, more adaptive form of gambling motivation. Though researchers have traditionally emphasized risk factors for problem gambling (Milosevic & Ledgerwood, 2010), there is also clinical value in understanding the etiology of non-problematic gambling motives. From a positive psychology perspective, we might argue that psychology has too often focused on problem gambling, with comparatively little focus on what underlies responsible gambling. The present findings suggest emerging adults who become more extraverted across emerging adulthood are the most likely to gamble socially—and presumably, are not in fact at increased risk for problem gambling (Lambe et al., 2015b). It is hoped that future research will paint a clearer picture of the "healthy gambler" subtype that might combine information regarding personality, motivations, and other sources to identify gamblers that are at low risk for developing a gambling problem.

Much has been published on personality traits and addictive behaviours, including gambling (MacLaren et al., 2011b). However, clinicians may need to consider that personality has both state-like and trait-like components, as it is not perfectly stable over time (Robins et al., 2001). Moreover, different trajectories of personality change might be associated with different gambling patterns, as in the alcohol problems literature (Littlefield et al., 2010). Thus, clinicians might consider how personality and mental health change together over time. Given that personality is at least partially malleable, personality- and motivation-focused interventions with young people have proven effective in the substance abuse area (Conrod, Stewart, Comeau, & Maclean, 2006). These approaches might be equally effective in the problem gambling prevention field. Future research might explore specific, personality-focused treatment strategies for problem gambling, especially since their underlying motivations may differ from person to person. As research progresses, it is becoming apparent that problem gambling is not a unitary construct, but rather a collection of subtypes (Milosevic & Ledgerwood, 2010; Nower et al., 2013; Vachon & Bagby, 2009). There are numerous different pathways to addiction, and as we approach a greater understanding of the different types of gamblers, we may be able to develop better effective, person-centered prevention and treatment strategies.

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Supplementary Materials

Exploratory Structural Equation Modelling

Certain authors have criticized the use of item parceling, and instead recommend analyzing data using individual items with exploratory structural equation modeling (ESEM) (Marsh, Lüdtke, Nagengast, Morrin, & Von Davier, 2013). This approach is a hybrid of exploratory factor analysis and SEM, and tests the measurement model and structural model simultaneously. ESEM is thought to be less biased than conventional confirmatory factor analysis in most practical applications when analyzing item-level data because it includes all possible cross-loadings (Asparouhov & Muthén, 2009). However, this decrease in bias comes at the cost of decreased model parsimony (i.e., many more parameters to estimate) (Asparouhov & Muthén, 2009) and may result in poorer interpretability, convergent validity, and discriminant validity (Herrmann & Pfister, 2013). As a point of comparison with the item-parcelled results presented in the main paper, data were re-analyzed using ESEM. In this model, factor loadings were constrained to equality and residuals were correlated across waves for the Big Five personality traits to account for the longitudinal nature of the data, and MLR estimation was used.

The model fit indices for the ESEM did not agree, $\chi^2(7827, N = 678) = 12228.30$ $p < .001$; CFI = .84; TLI = .83; RMSEA = .03, SRMR = .04. Notably, the absolute fit indices (RMSEA, SRMR) fit the data well, while indices that are relative to the null model (CFI, TLI) did not fit the data well. This discrepancy is likely due to the large number of variables in the model (63 in the present model). As the number of variables increases, absolute fit indices like RMSEA tend to be too liberal, while CFI and TLI tend to be too conservative when rejecting models (Kenny & McCoach, 2003). Given that these fit indices are similar in magnitude to those reported in prior research using ESEM on the NEO-FFI (Marsh et al., 2010), the unresolved problems with fit indices for models with many variables (Kenny & McCoach, 2003), and that the pattern of factor loadings is consistent with theory and research (Robins et al., 2001), we cautiously accepted the model as well-fitting.

Table S1
Selected unstandardized an,m.d standardized path coefficients from ESEM analysis

Predictor	B	SE B	β	*p-value*
Predicting Wave 3 Personality (Test-Retest Stability)				
W1 Conscientiousness	0.70	0.04	0.72	< .001**
W1 Extraversion	0.72	0.06	0.71	< .001**
W1 Neuroticism	0.63	0.05	0.61	< .001**
W1 Agreeableness	0.78	0.04	0.84	< .001**
W1 Openness	0.86	0.04	0.90	< .001**
Predicting Enhancement Motives				
W3 Conscientiousness	-0.11	0.07	-0.11	.126
W3 Extraversion	0.10	0.07	0.10	.149
W3 Neuroticism	0.14	0.07	0.14	.053
W3 Agreeableness	-0.15	0.08	-0.14	.058
W3 Openness	0.00	0.08	0.00	.970
Predicting Social Motives				
W3 Conscientiousness	-0.03	0.07	-0.03	.636
W3 Extraversion	0.23	0.07	0.22	.002**
W3 Neuroticism	0.00	0.06	0.00	.971
W3 Agreeableness	-0.23	0.08	-0.20	.006**
W3 Openness	-0.09	0.07	-0.08	.195
Predicting Coping Motives				
W3 Conscientiousness	-0.11	0.07	-0.10	.131
W3 Extraversion	-0.02	0.08	-0.02	.779
W3 Neuroticism	0.09	0.07	0.09	.168
W3 Agreeableness	-0.16	0.07	-0.14	.026*
W3 Openness	-0.09	0.09	-0.08	.315

*$p < .05$, **$p < .01$

The same relationships reported in Table 2 of the main paper were re-examined in the EFA model and are reported in Table S1. Overall, a very similar pattern of results emerged. The most robust relationships were strong test-retest reliabilities, extraversion positively predicting social motives, and agreeableness negatively predicting social motives. When compared with the item-parcelling results, the following paths became non-significant in the ESEM analyses: (a) extraversion positively predicting enhancement motives, and (b) neuroticism positively predicting coping motives. The patterns of statistical significance for all other paths remained the same using $p < .05$ as the criterion.

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