



Advancing the Pathways Model: Financially Focused Self-concept and Erroneous Beliefs as Core Psychopathologies in Disordered Gambling

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Abstract

In the Pathways Model, there are three distinct etiological subtypes of disordered gambling (Behaviourally Conditioned, Emotionally Vulnerable, and Anti-Social Impulsive Risk-Taker). The Pathways Model also posits that erroneous gambling beliefs are a maintenance factor of disordered gambling across the subtypes. Yet, etiological factors and erroneous beliefs have largely been examined separately when determining disordered gambling subtype. Moreover, there may be heretofore unexamined maintenance factors that span the disordered gambling subtypes. In the current research, we addressed this gap by using latent profile analyses to assess the role both erroneous beliefs and financially focused self-concept (a novel maintenance factor) play in the determination of disordered gambling subtype. In Study 1, community members with gambling problems ($n=215$) completed the Gambling Pathways Questionnaire and Financially Focused Self-Concept Scale. In Study 2 ($n=290$), participants also completed the Gambling Beliefs Questionnaire. Results from both studies revealed three profiles that coincide with the subtypes in the Pathways Model as providing the best fit to the data. The three profiles were largely distinguished by low, medium, or high scores on the etiological factors, which is consistent with the disordered gambling subtypes being on different parts of the same continuum of psychopathology severity. Financial focus (Studies 1 and 2) and erroneous gambling beliefs (Study 2) were elevated across the three profiles, and both were higher among profiles with more severe psychopathology. Findings support a dimensional understanding of gambling disorder psychopathology and suggest that a financially focused self-concept may be a maintenance factor of disordered gambling.

Keywords Disordered gambling · Financial success · Latent profile analysis · Pathways Model · Self-concept

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Introduction

According to the Pathways Model (Blaszczynski & Nower, 2002), there are three etiological subtypes of disordered gambling characterized by the absence or presence of different premorbid psychopathologies: *Behaviourally Conditioned* (no premorbid psychopathology), *Emotionally Vulnerable* (having premorbid mood problems and using gambling to cope with negative affect), and *Anti-Social Impulsive Risk-Taker* (having anti-social and impulsive personality traits and using gambling to enhance positive affect). Providing support for these subtypes, a recent systematic review (see Kurilla, 2021) suggested that there are three subtypes of disordered gambling—subtypes that align well with those outlined in the Pathways Model. Additionally, a questionnaire designed to detect the three pathways (i.e., the Gambling Pathways Questionnaire (GPQ); Nower & Blaszczynski, 2017) confirmed that adults living with a gambling disorder can be distinguished by whether they fall into one of the three subtypes of disordered gambling based on premorbid risk factors.

Although there is now a small, but growing body of evidence that supports the tenets of the Pathways Model, an empirical gap exists in relation to core psychopathologies that maintain gambling across the subtypes. According to the Pathways Model, erroneous beliefs about gambling play such a role. Erroneous gambling beliefs are errors in thinking related to gambling, such as believing that one can alter the outcome of games of chance in their favor by way of personal skill (e.g., illusion of control; Langer, 1975; Wohl & Enzle, 2002). However, there is a lack of empirical evidence to substantiate the supposition that erroneous gambling beliefs are a core psychopathology that maintain gambling across the subtypes. Moreover, we contend it is unlikely that erroneous beliefs are the only factor that are common to all subtypes. That is, there are likely other core psychopathologies that may help to maintain disordered gambling across the etiological pathways that have yet to receive theoretical or empirical attention. This gap in knowledge has both basic and applied significance because the identification of core psychopathologies will ultimately enhance theory within the field of gambling studies as well as benefit prevention and treatment efforts.

The purpose of the current research was threefold. First, we sought to examine the replicability of previous efforts to validate the Pathways Model using the GPQ. Second, we wanted to assess whether erroneous gambling beliefs are present in all three subtypes. Third, we aimed to extend the reach of the Pathways Model by testing the heretofore unexamined idea that having a financially focused self-concept (for a recent review, see Tabri & Wohl, 2021) is a maintenance factor of disordered gambling that is present in all three subtypes. This was accomplished by way of two studies with community samples of people living with disordered gambling.

The Pathways Model of Disordered Gambling

According to the Pathways Model, people living with disordered gambling are a heterogeneous population in terms of etiology. That is, how and why people turn to gambling varies in terms of the presence and absence of psychopathology, maladaptive personality traits, and gambling motives. Central to the model is the existence of three distinct etiological subtypes of disordered gambling: Behaviourally Conditioned, Emotionally Vulnerable, and Anti-Social Impulsive Risk-Taker.

The person living with disordered gambling who is Behaviourally Conditioned does not have any premorbid risk factors and so have largely developed their gambling problems via the positive and negative reinforcement schedule of gambling. Those who are identified as Emotionally Vulnerable tend to have developed their gambling problems due to the positive and negative reinforcement schedule of gambling, but they are also prone to negative affect and use gambling to cope with stress in their lives. Lastly, those classified as an Anti-Social Impulsive Risk-Taker tend to have the same premorbid risk factors as those who are Emotionally Vulnerable, but they also tend to display other risk factors, which (as the pathway label suggests) includes anti-social and impulsive personality traits as well as risk-taking. To be clear, people who meet criteria for the Anti-Social Impulsive Risk-Taker subtype largely develop gambling problems because they seek to enhance positive affect through gambling.

Although research that directly assesses the Pathways Model is limited, comprehensive reviews of studies that have assessed the antecedents of disordered gambling have provided some support for three subtypes of disordered gambling that parallel those in the Pathways Model (Kurilla, 2021; Milosevic & Ledgerwood, 2010). A systematic review of the literature suggests a dimensional (rather than categorical) understanding of disordered gambling in that the three subtypes are likely on different parts of the same continuum of psychopathology severity (Kurilla, 2021). In other words, the degree of severity of the etiological factors is key to understanding differences between the subtypes (e.g., González-Ibáñez et al., 2003). However, the only published study that has used the GPQ directly to assess the validity of the Pathways Model (Nower & Blaszczynski, 2017) provided support for a categorical understanding of the three subtypes of disordered gambling. Thus, although an accumulating body of evidence has moved the Pathways Model beyond theory, more research using the GPQ is needed to better understand whether the distinct subtypes should be conceptualized as falling on a continuum of psychopathology severity or as discrete categories.

Moreover, despite the movement to validate the existence of three distinct subtypes, one aspect of the model—the existence of core psychopathologies that traverse the three subtypes—has been relatively neglected. Yet, the original formulation of the Pathways Model placed erroneous beliefs about the nature of gambling (i.e., false representations of the cause of gambling outcomes) as fundamental to the progression and maintenance of disordered gambling.

In fact, it is widely acknowledged that erroneous beliefs are instrumental in gambling persistence and loss of control over gambling (e.g., Delfabbro & Winefield, 2000; Toneatto et al., 1997). Specifically, there is a tendency for many gamblers to misunderstand the rules of probability, and to mistakenly attribute chance outcomes (e.g., wins or losses) to causal factors such as personal skill or environmental influences (for a review, see Goodie & Fortune, 2013). These erroneous beliefs tend to stem from the positive and negative reinforcement schedule of gambling. Specifically, classical and operant conditioning processes that are at play in all gambling games foster habitual patterns of gambling and erroneous beliefs related to the outcomes of the games played. As such, erroneous beliefs tend to be present in all people living with a gambling disorder, regardless of their path to disordered gambling. Moreover, correcting people's erroneous beliefs about gambling have been central to the treatment of disordered gambling and their reduction has been used as a metric for treatment success. Results of a meta-analysis showed that cognitive-behavioural treatment interventions that targeted erroneous gambling beliefs were successful at moderately reducing gambling involvement at post-treatment and 6-month follow-ups (Gooding & Tarrier, 2009). These results

support the idea that erroneous beliefs foster persistence in gambling, which is consistent with the Pathways Model.

We contend that it is unlikely that erroneous beliefs are the only core psychopathology at play in the progression and maintenance of disordered gambling. Specifically, in addition to erroneous beliefs there are likely other psychopathologies that help to maintain disordered gambling that are common to most people with gambling problems. In the current research, we tested whether there is at least one other core psychopathology that spans the subtypes outlined by the Pathways Model: Financially focused self-concept.

Financially Focused Self-concept and the Pathways Model

Most people who seek treatment for their disordered gambling express that their desire to have and win money was central to their gambling-related problem (Hodgins & El-Guebaly, 2004; Morasco et al., 2007). For instance, people living with a gambling disorder tend to report that winning money via gambling enhances their feelings of self-worth (Morasco et al., 2007; Turner et al., 2002). Additionally, those who have relapsed often note that their need to make money and optimism about doing so on gambling games as central reasons for their return to play (Hodgins & El-Guebaly, 2004). Likewise, those who are seeking treatment for their gambling disorder express a need to make money as a result of their continued play (Heiskanen, 2017). Furthermore, preoccupation with money as an indicator of prestige, power, and a means of acquiring wealth differentiates people who do and people who do not live with a gambling disorder (Błaszczynski & Nower, 2010). Buttressing prior research that involved people living with gambling problems, a recent meta-analysis found that financial motives have unique predictive utility for understanding gambling involvement and disordered gambling severity among community gamblers (Tabri et al., in press). That is, the association between financial motives and gambling outcomes were moderate and positive, and remained so after statistically controlling for shared variance with social, enhancement, and coping motives. Together, these findings suggest that the desire for financial success (i.e., accumulating money) may be important for understanding the progression and maintenance of disordered gambling.

Building on the aforementioned research, Tabri and colleagues (for a recent review, see Tabri & Wohl, 2021) put forth the supposition that people living with a gambling disorder tend to place overriding importance on their financial success for garnering self-definition and thus self-worth. Providing empirical support for their ideas, among people who have symptoms of disordered gambling, Tabri et al. (2021b) found that greater financially focused self-concept was moderately and positively associated with having mood problems before and after gambling became a problem, engagement in risky behaviours, as well as with impulsive and anti-social personality traits. Moreover, several studies have shown a positive and moderate association between financially focused self-concept and disordered gambling severity among community members who gamble (Tabri et al., 2017a, b, 2018, 2019). Of note, the association between financially focused self-concept and disordered gambling severity was robust in that it held even after statistically controlling for overlapping variance with various etiological risk factors for disordered gambling (e.g., impulsivity, materialism, relative deprivation, personal income, global self-esteem). Accordingly, a financially focused self-concept has unique predictive utility for understanding disordered gambling severity.

People are generally motivated to bolster their self-worth in domains on which their self-worth is staked (Crocker & Park, 2004) and so financially focused people should be

more likely to gamble for financial gain. At the same time, because money regulates the emotional states of financially focused people (e.g., “My moods are influenced by the amount of money I have”), their gambling may serve other functions, including coping and enhancement. The coping motive is characteristic of the Emotionally Vulnerable subtype and negative affect may increase gambling because the prospect of winning money provides an escape and hope for the future. Likewise, the enhancement motive is characteristic of the Anti-Social Impulsive Risk-Taker subtype and the desire to increase positive affect may motivate gambling because the prospect of winning money is arousing and exciting. Supporting these suppositions, Tabri et al. (2017b) found that greater financially focused self-concept was moderately and positively associated with financial, coping, and enhancement gambling motives among community members who gamble. They also found that financially focused self-concept was uniquely associated with each of the motives after statistically controlling for overlapping variance between the motives. As such, financially focused self-concept may help maintain disordered gambling across the subtypes because it engenders multiple motives for gambling.

Overview of the Current Research

In two studies, we examined whether a financially focused self-concept is a core psychopathology in disordered gambling. We posited that if it is a core psychopathology, akin to erroneous beliefs, it should be elevated in all three subtypes specified in the Pathways Model. To test this idea, we re-analyzed the data from two existing published and openly available studies (see Tabri et al., 2021b; <https://osf.io/angwk/>) in which people living with gambling problems completed the GPQ as well as a measure of financially focused self-concept (Studies 1 and 2) and erroneous gambling beliefs (Study 2). Tabri et al. (2021b) examined whether financial focus varied as a function of etiological subtype based on the GPQ’s classification guidelines. They found that financial focus was greater among the Anti-Social Impulsive Risk-Taker and Emotionally Vulnerable subtypes compared the Behaviourally Conditioned subtype. In the current research, we submitted participants’ responses to the GPQ as well as to measures of financial focus and erroneous beliefs to latent profile analyses (Ferguson et al., 2020; Johnson, 2021) to identify etiological subtypes of disordered gamblers. Latent profile analysis is a data-driven categorical latent variable approach that focuses on identifying subgroups of people within a population that share similarities in their scores on a certain set of variables. Using latent profile analyses in the current research, we were able to assess whether the data support a dimensional or categorical conceptualization of disordered gambling as well as the extent to which a financially focused self-concept is present across the disordered gambling subtypes.

Study 1

Method

Participants, Procedure and Measures

Briefly, participants were 215 Americans (128 men and 84 women; $M_{\text{age}}=35.62$ years, range=19–71 years) recruited via Amazon’s Mechanical Turk (MTurk). They responded

to a recruitment notice that requested people who had spent at least \$100 on their gambling activities in the last 12 months, thought that they had problems with their gambling, and were not currently in treatment for their gambling problems to participate in the study. All participants completed single-item questions to assess eligibility and only eligible participants were able to complete the study. Participants completed the 48-item GPQ (Nower & Blaszczynski, 2017), which included the following nine subscales: mood problems before gambling became a problem, mood problems since gambling became a problem, gambling motive to cope with stress, gambling motive to obtain meaning in life, childhood maltreatment, impulsivity personality traits and behaviours, anti-social personality traits and behaviours, general risk taking, and sexual risk taking. Participants responded to the GPQ items using a response scale with endpoints 1 (*strongly disagree*) and 6 (*strongly agree*). Participants also completed the 4-item Financially Focused Self-Concept Scale (FFS; Tabri, Wohl, et al., 2017b; also see Tabri et al., 2021a, b). Participants responded to the FFS items using a response scale with endpoints 0 (*not at all*) and 4 (*extremely*). To confirm that participants had gambling problems, they completed the 9-item Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). Participants responded to each PGSI item using a response scale with endpoints 0 (*never*) and 3 (*almost always*). The PGSI total score for the current sample ranged from 2 to 27, which confirmed that all participants had some degree of gambling problems. All scales and subscales were internally consistent (*as* ranged from 0.64 to 0.92). The full survey is available at <https://osf.io/angwk/>.

Data Analytic Approach

The nine subscales from the GPQ and the FFS were included together in latent profile analyses. A two-phase procedure was used to identify the model that provides the best fit to the data (Johnson, 2021). In Phase 1, four types of latent profile analyses were conducted that involved different restrictions on the variance–covariance matrix. In Type 1, variances for the same constructs are constrained to be equal across profiles and residual correlations between the constructs are not permitted above and beyond their association as part of the same profile. In Type 2, variances for the same constructs are freely estimated and so each construct can have a different amount of variation in each profile, but residual correlations between the constructs are not permitted. In Type 3, variances for the same constructs are constrained to be equal across profiles, and residual correlations between the constructs are permitted, but held equal across profiles. In Type 4, variances for the same construct and residual covariances are freely estimated within each profile. For each type of latent profile analysis, a series of models with different numbers of profiles (from two to five) were estimated. We then determined the best model in each type using different model fit indices.

The Bayesian Information Criterion (BIC) was used to determine which model provided the best fit to the data. The model with a lower BIC value provides a stronger fit to the data. We used the “elbow” method (Masyn, 2013), which involves plotting the BIC values from the different models and visually identifying the model at which decreases in BIC values start to diminish relative to the addition of more profiles. In addition, we used the Lo et al. (2001) likelihood ratio test (LMR-LRT) to compare adjacent models. A statistically significant LMR-LRT value indicates that the $k + 1$ model provides a better fit to the data than the k model. However, if the LMR-LRT was not statistically significant, then the BICs of the adjacent models were compared. Furthermore, we conducted checks for interpretability and precision of the results by examining whether any profile had small counts and entropy values close to one. Entropy values closer to one indicate that a given model is good at

classifying participants into groups based on their response patterns. If these checks were successful, then the bootstrap likelihood ratio test (BLRT) was used to confirm model fit. The BLRT is also a relative model test, with a statistically significant value indicating that the $k + 1$ model fits the data better than the k model. When the BLRT did not converge, we relied on BIC.

In Phase 2, the best fitting model within each type was compared to one another to identify the best fitting latent profile model across the four types. These models were compared in terms of BIC and their results were examined for interpretability in conjunction with theory. Lastly, in all the analyses, participants with missing data were included using Full Information Maximum Likelihood (Enders, 2010). The analyses were conducted using Mplus software version 8.

Results

Descriptive statistics and correlations between all subscales from the GPQ and FFS are reported in the bottom diagonal of Table 1.

Model Selection

Fit statistics for the four types of latent profile analyses with varying number of profiles (two to five) are reported in Table 2. For Type 1, we determined that the model with three profiles provided the best fit to the data based on the BIC “elbow” method. We could not use the elbow method for Types 2, 3 and 4 as there were fewer than four models that converged. Although the Type 1 model with three profiles provided a good fit to the data, the BIC was slightly larger than the Type 2 model with three profiles. Thus, the Type 2 model with three profiles was a better fitting model. Of note, unlike the Type 1 model with three profiles, the Type 2 counterpart does not make an unrealistic assumption of equal variances (e.g., larger profiles may have more variation, and profiles with very high or very low scores may have less variation). Moreover, although the Type 3 model with three profiles had a smaller BIC than the Type 2 model with three profiles, one of the profiles included eight participants (3.72% of the total sample), which is problematic as very large sample sizes are needed to detect small profiles. As for the Type 4 models, the only model that converged included two profiles, which is inconsistent with the Pathways Model and so it was rejected. Accordingly, the Type 2 model with three profiles was deemed to be the overall best fitting model.

Model Results

Table 3 contains descriptive statistics for the three latent profiles. To facilitate interpretation, the mean values of the constructs for each profile are illustrated in Fig. 1 in z -score format such that deviations from zero are interpreted as standard deviations above or below the mean of the total sample. As shown in Fig. 1, participants in Profile 1 were characterized as having relatively low levels on all etiological risk factors (z -scores ranged between -0.56 and -1.25). Likewise, in terms of the absolute level, the observed means in Profile 1 were low. The range was between 1.32 and 2.52 (see Table 3), which corresponds with the *disagree* side of the response scale. As such, Profile 1 coincides with the Behaviourally Conditioned subtype.

Table 1 Descriptive statistics and correlations between financial focus, disordered gambling severity, and subscales of the gambling pathways questionnaire in Studies 1 and 2

Variable	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9	10	11	<i>M (SD)</i>
1. Mood (pre)	3.15 (1.51)	–	.64**	.38**	.40**	.52**	.35**	.43**	.29**	.47**	.25**	.18**	3.29 (1.41)
2. Mood (post)	3.47 (1.32)	.63**	–	.32**	.41**	.54**	.44**	.41**	.24**	.45**	.30**	.19**	3.69 (1.38)
3. Childhood maltreatment	2.29 (1.21)	.42**	.43**	–	.45**	.45**	.41**	.41**	.40**	.51**	.15**	.18**	2.63 (1.37)
4. Stress-coping motive	3.74 (1.21)	.43**	.41**	.38**	–	.59**	.72**	.60**	.35**	.55**	.29**	.47**	3.72 (1.14)
5. Impulsive traits	3.34 (1.08)	.33**	.34**	.38**	.43**	–	.60**	.74**	.45**	.78**	.39**	.37**	3.52 (1.22)
6. Meaning motive	3.49 (1.22)	.32**	.44**	.38**	.56**	.61**	–	.65**	.33**	.54**	.47**	.61**	3.77 (1.14)
7. Risk-taking	3.14 (1.23)	.23**	.27**	.34**	.41**	.70**	.63**	–	.54**	.76**	.28**	.45**	3.27 (1.18)
9. Sexual risk-taking	2.38 (1.45)	.18*	.22**	.31**	.26**	.46**	.41**	.56**	–	.65**	.16**	.18**	2.49 (1.47)
9. Anti-social traits	2.80 (1.14)	.34**	.35**	.50**	.38**	.75**	.58**	.76**	.62**	–	.27**	.32**	2.94 (1.22)
10. FFS	2.73 (.77)	.21**	.35**	.28**	.39**	.39**	.57**	.45**	.27**	.39**	–	.41**	2.95 (.74)
11. Erroneous beliefs	–	–	–	–	–	–	–	–	–	–	–	–	5.01 (.88)

Descriptive statistics and correlations below the diagonal are from Study 1 whereas descriptive statistics and correlations above the diagonal are from Study 2. *N* Study 1 = 215, *N* Study 2 = 290. **p* < .05; ***p* < .01
 FFS financially focused self-concept

Table 2 Model fit indices of the latent profile analyses in Study 1

Number of profiles	BIC	LMRT <i>p</i> value	BLRT <i>p</i> value	Entropy	Smallest class size %
Type 1: Equal variances across profiles and no residual covariances					
2	6392.62	< .01	< .01	.89	41.39
3	6278.04	.03	< .01	.87	23.72
4	6253.93	.54	< .01	.88	11.62
5	6254.61	.69	< .01	.89	3.25
Type 2: Free variances across profiles and no residual covariances					
2	6380.06	< .01	NC	.90	46.98
3	6256.12	.13	NC	.92	20.46
4	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
Type 3: Equal variances across profiles with equal residual covariances across profiles					
2	6159.72	.001	NC	.81	44.19
3	6150.97	.21	< .01	.88	3.72
4	6154.17	.30	NC	.88	3.80
5	NC	NC	NC	NC	NC
Type 4: Free variances and free residual covariances within each profile					
2	6264.81	.03	< .01	.91	33.85
3	NC	NC	NC	NC	NC
4	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
Final model comparisons					
Type 1: 3	6278.04	.03	< .01	.87	23.72
Type 2: 3	6256.12	.13	NC	.92	20.46
Type 3: 3	6150.97	.21	NC	.88	3.72
Type 4: 1	6264.81	.03	< .01	.91	33.85

BIC Bayesian information criterion, *LMRT* Lo, Mendell, and Rubin likelihood ratio test, *BLRT* bootstrap likelihood ratio test, *NC* non-convergence

Table 3 Means and standard deviations for each latent profile in Study 1

Factor	Latent profile 1 (n = 44)	Latent profile 2 (n = 108)	Latent profile 3 (n = 63)
Mood problems (pre)	1.71 (0.72)	3.31 (1.45)	3.86 (1.67)
Mood problems (post)	2.30 (0.95)	3.47 (1.24)	4.27 (1.05)
Stress coping motivation	2.65 (1.18)	3.76 (0.96)	3.64 (0.76)
Meaning motivation	2.30 (0.94)	3.28 (0.97)	4.66 (0.66)
Childhood maltreatment	1.25 (0.37)	2.21 (1.10)	3.14 (1.15)
Impulsivity traits	2.24 (0.73)	3.13 (0.79)	4.52 (0.65)
Anti-social traits	1.55 (0.48)	2.52 (0.70)	4.13 (0.68)
Risk taking	1.89 (0.58)	2.87 (0.93)	4.45 (0.75)
Sexual risk taking	1.26 (0.48)	2.09 (1.21)	3.63 (1.39)
Financially focused self-concept	2.20 (0.77)	2.64 (0.69)	3.26 (0.55)

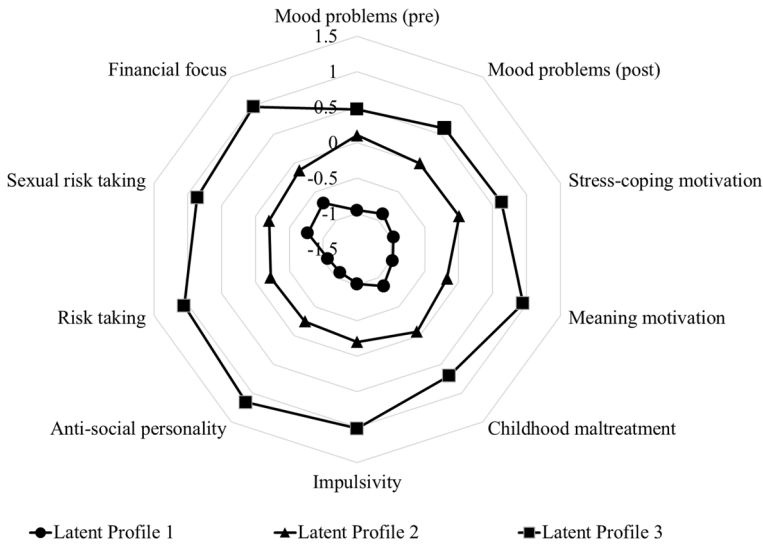


Fig. 1 Results of the Type 2 latent profile analysis with three profiles in Study 1

Participants in Profile 2 scored relatively higher on all etiological risk factors (z -scores ranged between 0.03 and -0.18 ; see Fig. 1). In terms of absolute level, the observed means in Profile 2 indicate that participants had mood problems before and after gambling became a problem, stress-coping and meaning motivation, impulsivity, and risk taking. The observed mean values for these constructs ranged from 2.98 to 3.78, which correspond to the midpoint or higher on the response scale (i.e., 3; the *agree* side; see Table 3). The observed means for the remaining constructs were 2.56 or lower (see Table 3), which are below the midpoint of the scale (the *disagree* side). Accordingly, Profile 2 coincides with the Emotionally Vulnerable subtype, but also includes some impulsivity and risk taking.

Participants in Profile 3 scored the highest on all constructs (z -scores ranged between 0.38 and 0.76; see Fig. 1). In terms of absolute level, the observed means indicate that participants had moderate to high levels of mood problems before and after gambling became a problem, stress-coping and meaning motivation, impulsivity, risk taking, and sexual risk taking as well as anti-social traits and behaviours. The observed mean values for these constructs ranged from 3.87 to 4.64 (see Table 3), which is above the midpoint of the response scale (the *agree* side). Thus, Profile 3 coincides with the Anti-Social Impulsive Risk-Taker subtype.

In terms of FFS, as expected, a financially focused self-concept was elevated across the three profiles (see Table 3). The lowest scoring profile (Profile 1) had an FFS mean of 2.21, which is just above the midpoint of the response scale (i.e., 2), whereas Profiles 2 and 3 had higher levels of FFS.

Discussion

The results of Study 1 are consistent with the Pathways Model. Specifically, the three profiles we uncovered using the GPQ largely coincide with the three subtypes specified in the Pathways Model. They are also very similar to the profiles observed by Nower and Blaszczynski (2017). The one exception is that in the current study (compared to Nower

& Blaszczynski, 2017) participants in Profile 3 (what we labelled as the Anti-Social Risk-Taker subtype) had mood problems before developing gambling problems. Our findings are more consistent with the Pathways Model because the model specifies that the Anti-Social Impulsive Risk-Taker subtype is a subset of the Emotionally Vulnerable subtype—a subtype that has premorbid mood problems. Study 1 also supported our general hypothesis that financially focused self-concept is elevated across the three profiles. Participants in Profile 1 (Behaviourally Conditioned) had the lowest financial focus score, participants in latent Profile 3 (Anti-Social Impulsive Risk-Taker) had the highest score, and participants in latent Profile 2 (Emotionally Vulnerable) scored between participants in Profiles 1 and 3. Together, the findings suggest that financially focused self-concept can range from moderate to high among people with gambling problems and that financial focus increases as the number of etiological risk factors increase.

Study 2

The purpose of Study 2 was to replicate and extend the results observed in Study 1. To this end, we re-analyzed data from a large community sample of Americans living with gambling problems. These data not only included the GPQ, FFS, and PGSI, but also a measure of erroneous beliefs about gambling. As such, the data set allowed us to test whether financial focus and erroneous beliefs are core (and unique) psychopathologies that maintain gambling across the three subtypes of disordered gambling.

Method

Participants, Procedure, Measures, and Data Analytic Approach

As in Study 1, participants were recruited via MTurk and eligibility criteria were identical to that of Study 1. Participants were 290 Americans (159 men and 131 women; $M_{\text{age}} = 33.96$ years, range = 18–69 years) who believe they have gambling problems but who were not in treatment for their gambling problems. They also spent at least \$100 on their gambling activities in the last 12 months. Participants completed the GPQ, FFS, and PGSI. The PGSI total score for the current sample ranged from 3 to 27, which confirmed that all participants had some degree of gambling problems. In addition, participants completed the 21-item Gambling Beliefs Questionnaire (GBQ; Steenbergh et al., 2002). The GBQ measures erroneous gambling beliefs in terms of illusion of control and beliefs in luck. Participants responded to each item on the GBQ using a response scale with endpoints 1 (*strongly disagree*) and 7 (*strongly agree*). The items were averaged to form an erroneous beliefs scale. All scales and subscales were internally consistent (α s ranged from 0.74 to 0.92). The full survey is available at <https://osf.io/angwk/>. Lastly, the data analytic approach was identical to that of Study 1.

Results

Descriptive statistics and correlations between all subscales from the GPQ as well as the FFS and erroneous gambling beliefs are reported in the top diagonal of Table 1.

Model Selection

Fit statistics for the four types of latent profile analyses with varying number of profiles (two to five) are reported in Table 4. For the Type 1 models, we determined that the model with three profiles provided the best fit to the data based on the BIC “elbow” method. We could not use the elbow method for Types 2, 3 and 4 as there were fewer than four models that converged. However, for the Type 2 models, the LMRT was not statistically significant when comparing four profiles with three profiles thereby favouring three profiles. Also, although the BIC for the Type 1 model with three profiles was a little smaller than its Type 2 counterpart, the Type 2 counterpart does not make an unrealistic assumption of equal variances for constructs across profiles. As such, the Type 2 model with three profiles was favoured over its Type 1 counterpart. As for the Type 3 and Type 4 models, the only models that converged included two profiles, which is inconsistent with the Pathways Model. The BICs for these models were also larger than the Type 2 model with three profiles (see

Table 4 Model fit indices of the latent profile analyses in Study 2

Number of profiles	BIC	LMRT <i>p</i> value	BLRT <i>p</i> value	Entropy	Smallest class size %
Type 1: Equal variances across profiles and no residual covariances					
2	9282.65	<.01	<.01	.89	47.93
3	9010.48	.06	<.01	.89	26.21
4	8953.27	.04	<.01	.88	11.72
5	8933.45	.58	<.01	.86	10.69
Type 2: Free variances across profiles and no residual covariances					
2	9281.51	<.01	<.01	.90	48.62
3	9034.02	<.01	NC	.92	15.52
4	8985.64	.13	NC	.93	8.27
5	NC	NC	NC	NC	NC
Type 3: Equal variances across profiles with equal residual covariances across profiles					
2	9125.29	<.01	NC	.85	46.90
3	NC	NC	NC	NC	NC
4	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
Type 4: Free variances and free residual covariances within each profile					
2	9115.89	<.01	NC	.86	45.52
3	NC	NC	NC	NC	NC
4	NC	NC	NC	NC	NC
5	NC	NC	NC	NC	NC
Final model comparisons					
Type 1: 3	9010.48	.06	<.01	.89	26.21
Type 2: 3	9034.02	<.01	NC	.92	15.52
Type 3: 1	9125.29	<.01	NC	.85	46.90
Type 4: 1	9115.89	<.01	NC	.86	45.52

BIC Bayesian information criterion, *LMRT* Lo, Mendell, and Rubin likelihood ratio test, *BLRT* bootstrap likelihood ratio test, *NC* non-convergence

Table 5 Means and standard deviations for each latent profile in Study 2

Factor	Latent profile 1 (n=99)	Latent profile 2 (n=146)	Latent profile 3 (n=45)
Mood problems (pre)	2.43 (1.25)	3.42 (1.19)	4.70 (1.05)
Mood problems (post)	2.76 (1.24)	3.92 (1.16)	4.95 (0.85)
Stress coping motivation	2.79 (0.97)	3.95 (0.85)	4.98 (0.55)
Meaning motivation	2.80 (0.99)	3.99 (0.77)	5.10 (0.62)
Childhood maltreatment	1.73 (0.97)	2.85 (1.26)	3.84 (1.23)
Impulsivity traits	2.30 (0.75)	3.81 (0.73)	5.16 (0.60)
Anti-social traits	1.73 (0.54)	3.20 (0.83)	4.63 (0.67)
Risk taking	2.10 (0.75)	3.54 (0.68)	4.85 (0.71)
Sexual risk taking	1.52 (0.80)	2.67 (1.34)	3.96 (1.54)
Financially focused self-concept	2.57 (0.73)	3.05 (0.68)	3.45 (0.52)
Erroneous gambling beliefs	4.58 (0.86)	5.03 (0.78)	5.87 (0.53)

Table 4). Thus, the Type 2 model with three profiles was deemed to be the overall best fitting model.

Model Results

Table 5 contains descriptive statistics for the three latent profiles. As shown in Fig. 2, participants in Profile 1 were characterized as having relatively low levels on all etiological risk factors (z -scores ranged between -0.52 and -1.00). Likewise, in terms of the absolute level, the observed means in Profile 1 were low. The range was between 1.52 and 2.80 (see Table 5), which corresponds with the *disagree* side of the response scale. As such, Profile 1 coincides with the Behaviourally Conditioned subtype.

Participants in Profile 2 scored relatively higher on all etiological risk factors (z -scores ranged between 0.02 and 0.24; see Fig. 2). In terms of absolute level, the observed means in Profile 2 indicate that participants had moderate mood problems before and after gambling became a problem, stress-coping and meaning motivation, impulsivity, anti-social traits and behaviours, and risk taking. The observed mean values for these constructs ranged from 3.20 to 3.99, which are higher than the midpoint on the response scale (i.e., 3; the *agree* side; see Table 5). The observed means for the remaining constructs were 2.85 or lower (see Table 5), which are below the midpoint of the scale (the *disagree* side). Accordingly, Profile 2 coincides with the Emotionally Vulnerable subtype, but also includes some impulsivity, anti-social traits and behaviours, and risk taking.

Participants in Profile 3 scored the highest on all constructs (z -scores ranged between 0.99 and 1.38; see Fig. 2). In terms of absolute level, the observed means indicate that participants had moderate to high levels of mood problems before and after gambling became a problem, stress-coping and meaning motivation, impulsivity, risk taking, and sexual risk taking as well as anti-social traits and behaviours. The observed mean values for these constructs ranged from 3.96 to 5.16 (see Table 5), which is above the midpoint of the response scale (the *agree* side). Thus, Profile 3 coincides with the Anti-Social Impulsive Risk-Taker subtype.

In terms of FFS, as expected, financially focused self-concept was elevated across the three profiles (see Table 5). The lowest scoring profile (Profile 1) had an FFS mean of

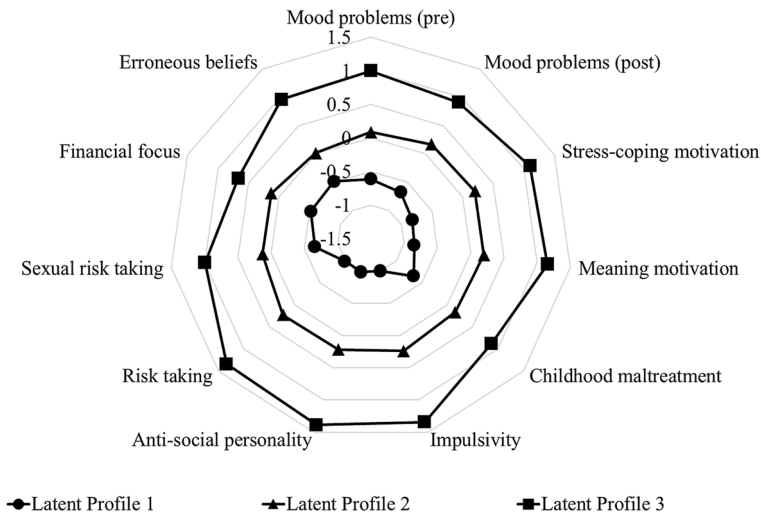


Fig. 2 Results of the Type 2 latent profile analysis with three profiles in Study 2

2.57, which is above the midpoint of the response scale (i.e., 2), whereas Profiles 2 and 3 had higher levels of FFS. Likewise, as expected, erroneous gambling beliefs were elevated across the three profiles (see Table 5). The mean score of the lowest scoring profile (Profile 1) was 4.58, which is above the midpoint of the response scale (i.e., 4). As well, the mean score for erroneous gambling beliefs was higher in Profiles 2 and 3.

Discussion

The results of Study 2 provided strong support for three basic tenets of the Pathways Model. First, latent profile analyses revealed three profiles that aligned with the three subtypes outlined in the Pathways Model. Second, participants in Profile 3, known as the Anti-Social Impulsive Risk-Taker subtype in the Pathways Model, had mood problems before developing gambling problems. Lastly, erroneous gambling beliefs were elevated across the three profiles. Study 2 also provided strong support for our proposed extension to the Pathways Model. Replicating what was observed in Study 1, akin to erroneous beliefs, financial focus was elevated across the three profiles. Financial focus was highest among those categorized as Anti-Social Impulsive Risk-Taker (i.e., Profile 3) and lowest among those categorized as Behaviourally Conditioned (i.e., Profile 1). Financial focus among those categorized as Emotionally Vulnerable (i.e., Profile 2) was in between the other two. Together, the findings suggest that financially focused self-concept is a strong candidate for consideration as a core psychopathology in the Pathways Model alongside erroneous beliefs.

General Discussion

The Pathways Model is the most promising and widely accepted etiological model of disordered gambling. In the Pathways Model, there are three etiological subtypes of gambling disorder (Behaviourally Conditioned, Emotionally Vulnerable, and Anti-Social/Impulsive), each differentiated by a set of predisposing biopsychosocial characteristics. To date, however, only one core psychopathology—erroneous beliefs about gambling—has been outlined in the Pathways Model and given empirical consideration within the context of the model. In the current research, we hypothesized and found support for the idea that a financially focused self-concept may be a novel core psychopathology. That is, people living with a gambling disorder have an elevated tendency to base their self-concept in large part on their financial success. As a result, their self-worth can ebb and flow depending on whether or not they are winning money whilst gambling. In practice, what this means is that gamblers with a financially focused self-concept are apt to continue playing despite accumulating losses due to their need to succeed. Unfortunately, the net result is often excessive gambling and heightened gambling-related harms.

In Study 1, we demonstrated the presence of three profiles of gamblers that are consistent with the three subtypes specified in the Pathways Model. In line with expectations, participants reported elevated levels of financially focused self-concept in each of the three profiles. However, there was some variation among the profiles. Those who fit into the Behaviourally Conditioned subtype had the lowest financial focus score. They were followed by those who fit into the Emotionally Vulnerable subtype. The highest level of financial focus was observed among those who fit the description of the Anti-Social Impulsive Risk-Taker subtype. In Study 2, we once again found elevated levels of financial focus in all three subtypes outlined by the Pathways Model. Importantly, the findings indicate that having an elevated financial focus is characteristic of the three subtypes over and above the etiological factors (Studies 1 and 2) and the one previously identified core psychopathology: erroneous beliefs about gambling (Study 2).

Implications

The results of the current research have important implications for the Pathways Model, and disordered gambling by extension. First, the findings add to the small but growing body of research that has provided empirical support for the subtypes identified by the Pathways Model (Alvarez-Moya et al., 2010; González-Ibáñez et al., 2003; Gupta et al., 2013; Moon et al., 2017; Nower & Blaszczynski, 2017; Nower et al., 2013). Of note, results of a recent systematic review of the literature that examined the subtypes in the Pathways Model support a dimensional (rather than categorical) understanding of disordered gambling in that the three subtypes likely fall on different parts of the same continuum of psychopathology severity (Kurilla, 2021). Consistent with the dimensional perspective and the fundamental tenets of the Pathways Model, we found evidence for three profiles that coincide with the Behaviourally Conditioned, Emotionally Vulnerable, and Anti-Social Impulsive Risk-Taker subtypes. The three profiles were largely distinguished by low (Behaviourally Conditioned), medium (Emotionally Vulnerable), or high (Anti-Social Impulsive Risk-Taker) scores on the etiological risk factors. These findings were observed using the GPQ—a measure designed to test for the presence of three subtypes specified in the Pathways Model among people living with disordered gambling. As such, not only did we provide empirical evidence for the Pathways Model, we also demonstrated that the GPQ is both a reliable and

valid instrument for assessing the etiological subtypes of disordered gambling. Such a tool is critical for researchers to advance the study of disordered gambling and for health care providers to develop individualized treatments that target both gambling behaviour as well as associated etiological risk factors that may undermine recovery and precipitate relapse.

Second, again in accordance with the Pathways Model, we were able to verify that erroneous gambling beliefs are present in all three subtypes. Although prior research has shown that erroneous gambling beliefs are elevated among people with disordered gambling (for a review and meta-analysis, see Goodie & Fortune, 2013), no prior research has examined erroneous gambling beliefs when subtyping disordered gambling based on *all* the etiological factors outlined in the Pathways Model and erroneous gambling beliefs. Indeed, to our knowledge, only one study has examined the subtyping of gamblers based on different impulsivity traits and erroneous gambling beliefs (Devos et al., 2020). The results were consistent with the Pathways Model, but there was one additional subgroup of people with disordered gambling that did not have erroneous gambling beliefs, which contradicts the Pathways Model. Because we examined all etiological factors and Devos et al. (2020) only examined impulsivity, it is unclear why the authors observed a subgroup of participants with gambling problems without erroneous gambling beliefs.

Third, we extended the reach of the Pathways Model by testing and finding evidence for the idea that having a financially focused self-concept (Tabri et al., 2017b; for a recent review, see Tabri & Wohl, 2021) is a common thread that runs through the three etiological subtypes of disordered gambling specified in the Pathways Model. Because financially focused people who gamble are more likely to have etiological risk factors outlined in the Pathways Model (Tabri et al., 2017a, b, 2018), it follows that their gambling likely serves multiple functions, including to make money, cope with life stress, and enhance positive affect. Currently unknown is whether financially focused self-concept plays a role in the remission from disordered gambling. Some research (e.g., Morasco et al., 2007; Turner et al., 2006) suggests that people who are seeking treatment for disordered gambling often express that their self-worth ebbed and flowed depending on whether they were winning money whilst gambling. Additionally, relapse has been shown to be associated with optimism about winning money as well as the perceived need to win money (Hodgins & El-Guebaly, 2004). When taken together with the findings of the current research, we contend that treatment success may be a function of the extent to which a financial focus has been downregulated.

In sum, an expanded Pathways Model that includes both etiological psychopathologies that differentiates between disordered gamblers and core psychopathologies common to most disordered gamblers would increase predictive utility and thus benefit prevention and treatment efforts.

Limitations and Future Directions

The implications of the current research are limited by the correlational design employed. To rigorously address this limitation, a longitudinal prospective design is needed wherein people at high risk for disordered gambling based on the etiological factors are tracked over time and the onset and maintenance of disordered gambling is mapped out. Importantly, the development of financially focused self-concept would also be tracked over time and examined as a predictor of the onset and maintenance of disordered gambling.

Furthermore, because financially focused self-concept is theorized to be a maintenance factor of disordered gambling, it would behoove researchers to examine whether the act

of gambling cultivates a financially focused self-concept akin to how the reinforcement schedule of gambling gives rise to erroneous gambling beliefs in the Pathways Model. It is possible that the ebb and flow of winning and losing money creates a preoccupation with financial success among gamblers that grows with greater gambling involvement over time. Of note, there is emerging evidence that the FFS used to measure the financially focused self-concept construct in the current research has strong temporal measurement invariance (Tabri et al., 2021a), which positions it for use in longitudinal research (Fried et al., 2016; Newsom, 2015).

Additionally, it should be noted that participants were recruited from MTurk. Although there is evidence that samples recruited from MTurk provide valid and reliable data for research on addictive behaviours, including gambling (see Kim & Hodgins, 2017), a recent rapid review suggests that samples of people recruited online for gambling research (via Internet panels and crowdsourcing websites) may provide low quality data (Pickering & Blaszczynski, 2021). Tabri et al. (2021b) tried to mitigate this issue by following the recommendations outlined by Pickering and Blaszczynski (2021) to enhance data quality. Specifically, participants were pre-screened for eligibility (they had to answer several eligibility questions), and ineligible participants were not permitted to complete the survey. As well, eligible participants who failed at least one attention check were excluded from the analyses. Given the current findings are consistent with prior research on the Pathways Model that did not use online recruitment (e.g., Nower & Blaszczynski, 2017), we are confident that the procedure used to ensure high data quality was successful. Put differently, we believe the method of recruitment had little or no influence on the validity and reliability of the results.

Conclusion

The current research examined and found support for key tenets of the Pathways Model. Three profiles were observed that coincided with the three subtypes of disordered gambling specified in the Pathways Model. Moreover, as suggested in the Pathways Model, erroneous gambling beliefs were elevated among the three subtypes of disordered gambling. Extending the Pathways Model, we observed that a financially focused self-concept was also elevated across the three subtypes of disordered gambling. Accordingly, financially focused self-concept may be a novel core maintenance factor of disordered gambling.

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Data availability There is no preregistration associated with the current submission. Materials and data are publicly available on the Open Science Framework: <https://osf.io/jqugn>.

Declarations

Ethical approval The current research involved a secondary analysis of previously published (see Tabri et al., 2021b, in *Addiction Research & Theory*) and publicly available data (see <https://osf.io/angwk/>). The original research reported by Tabri et al. (2021b) received ethics approval from Carleton University Research Ethics Board—B (#105439).

Conflict of interest Dr. Nassim Tabri has received consulting fees from the gambling industry in Canada, New Zealand, the US, and the UK via Gamres Limited—a research and consultancy service that designs, implements, and evaluates responsible gambling strategies. He has also received research funding as Principal Investigator or Co-Investigator from Carleton University (Canada), Gambling Exchange Ontario (Canada), and International Center for Responsible Gambling (US) to support his gambling research. Dr. Michael J. A. Wohl has received research funding from federal granting agencies in Canada and Australia unconnected to his gambling research. In relation to his gambling research, he has received research funds from provincial granting agencies in Canada. He has also received direct and indirect research funds from the gambling industry in Canada, United States of America, United Kingdom, Australia, and Sweden. Additionally, he has served as a consultant for the gambling industry in Canada, United States of America, United Kingdom, and New Zealand. A detailed list can be found on his curriculum vitae (<http://carleton.ca/bettermentlabs/wp-content/uploads/CV.pdf>).

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