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Abstract

Growing evidence for the efficacy of cognitive-behavioral therapy for disordered gambling supports the need for a comprehensive set of gambling-related assessment measures that have been validated with treatment-seeking samples. The Gamblers’ Beliefs Questionnaire (GBQ) is a self-report measure that was designed to identify gambling-related cognitive distortions (Steenbergh, Meyers, May, & Whelan, 2002). In this study, the GBQ demonstrated good internal consistency and adequate construct validity in a treatment-seeking sample of disordered gamblers. Additionally, scores on the measure significantly decreased across a brief cognitive-behavioral treatment, providing validity support for use of the GBQ with a clinical population.
Psychometric Evaluation of the Gamblers’ Beliefs Questionnaire with Treatment-Seeking Disordered Gamblers

Growing evidence supports the role of gambling-related cognitive distortions in the development and maintenance of disordered gambling\(^1\) (for reviews, see Fortune & Goodie, 2012; Goodie & Fortune, 2013). There is also evidence supporting the utility of assessing such distortions when treating individuals with gambling problems (Ladouceur et al., 2001; Toneatto & Gunaratne, 2009). Given the role of cognitive distortions in disordered gambling, a valid and efficient method of assessing gambling-related cognitive distortions is needed for research and clinical efforts (Goodie & Fortune, 2013). The present investigation was designed to evaluate the psychometric properties and treatment sensitivity of a self-report measure of gambling-related cognitive distortions in a sample of treatment-seeking disordered gamblers.

The literature establishing the role of cognitive distortions in disordered gambling has stimulated the use of cognitive interventions as a component when treating gambling problems (for recent reviews, see Fortune & Goodie, 2012, and Gooding & Tarrier, 2009). The accurate assessment of gambling-related cognitive distortion is valuable because the use of cognitive restructuring as a component of treatment has been shown to have a role in reducing problem gambling behavior (Ladouceur et al., 2001; Whelan, Steenbergh, & Meyers, 2007). Toneatto and Gunaratne (2009) found that an overall reduction in cognitive distortions was an important indicator of beneficial treatment outcomes.

Self-report has been shown to be a valid and efficient method for assessing cognitive distortions. Goodie & Fortune (2013) aggregated findings from self-report measures and evaluated the association between cognitive distortions and disordered gambling. Since gambling-related cognitive distortions are drawn from the general literature on heuristics and biases present
across the whole population, even recreational gamblers endorse some level of cognitive distortions about chance outcomes. What is significant is that disordered gamblers overwhelmingly endorse more cognitive distortions and hold these distortions more strongly. Additionally, specific groupings of cognitive distortions, such as thoughts related to illusions of control or the gambler’s fallacy, tend to differentially correspond with gambling rates. However, Goodie and Fortune (2013) did not find that these dimensions were on their own better predictors of generalized distortion or disorder, cautioning the perceived importance of these predictive dimensions “appears to be either a coincidence or an accident of researchers predilections (p. 12).” Goodie and Fortune (2013) reported a large effect for the overall association between cognitive distortions and disordered gambling. They recommended future efforts focus on understanding the role of specific distortions and the performance of distortions in populations meeting diagnostic criterion (Goodie & Fortune, 2013).

According to Goodie and Fortune (2013), one self-report measure that discriminated non-disordered and disordered gamblers was the Gamblers’ Beliefs Questionnaire (GBQ; Steenbergh, Meyers, Whelan, & May, 2002). The GBQ items were developed based on empirical evidence on cognitions associated with gambling, expert recommendations, and examination of the theoretical literature (Steenbergh et al., 2002). The measure can be used to assist in case conceptualization, treatment planning, cognitive restructuring, and monitoring behavior change (Lipinski, Whelan & Meyers, 2007). The GBQ was initially evaluated with a diverse sample of community gamblers and college students (Steenbergh et al., 2002). It demonstrated high internal consistency ($\alpha = .92$), 1-month test-retest reliability ($r = .77$), and significant convergence with scores on measures of gambling severity, the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), and the
DSM-IV-Questionnaire (DSM-IV-Q; Shaffer, LaBrie, Scanlan, & Cummings, 1994). Disordered gamblers reported significantly more cognitive distortions on the GBQ than non-disordered gamblers, and higher GBQ total scores were associated with longer gambling sessions.

Additionally, the results of a factor analysis suggested patterns of distortions that were highly correlated with each other and emerged along two dimensions. The first dimension included distortions related to illusion of control and overestimating the influence of one’s skills on the outcome of chance-determined games. The second dimension included distortions of perseverance and luck such as overestimating the chance of winning, and beliefs that one is prone to good fortune. Several items were also related to the gamblers’ fallacy (e.g., “I should keep the same bet even when it hasn’t come up lately because it is bound to win”).

Recent investigations have provided support for the validity of the GBQ. MacKillop, Anderson, Castelda, Mattson, and Donovick (2006a) reported convergence between the GBQ dimension scores, SOGS score, and subscales scores of the Gambling Passion Scale, and Eysenck Impulsivity Questionnaire. Mitrovic and Brown (2009) found GBQ dimension scores significantly correlated with scores on the Canada Problem Gambling Index, the Gambling Motivation Scale, and the Toronto Alexithymia Scale. These findings suggest that GBQ scores are significantly related to disordered gambling and other constructs associated with the development and maintenance of gambling pathology. Researchers have also found significantly higher GBQ scores among disordered gamblers as compared to non-disordered gamblers (Mackillop et al., 2006b; Myrseth, Brunborg, & Eidem, 2010). Moreover, higher scores on items related to the Luck/Perseverance dimension have been associated with greater enjoyment of gambling and more negative attitudes toward seeking treatment for disordered gambling (Wohl,
Young, & Hart, 2007). Recent findings have also established the GBQ as an internally consistent measure (e.g., Mackillop et al., 2006a; Myrseth et al., 2010).

Translations of GBQ have shown promising psychometric properties. Winfree, Meyers, & Whelan (2013) evaluated a Spanish adaptation of the measure (GBQ-S) and found evidence of convergent validity between GBQ-S scores and scores on two measures of gambling symptomatology. A Chinese-translated version (GBQ-C) correlated significantly with relevant measures of problem gambling in a sample of adolescents (Wong & Tsang, 2011). Finally, Marchetti (2013; manuscript in preparation) evaluated an Italian version of the GBQ. Preliminary evidence suggested adequate psychometric properties consistent with findings from other language versions. These results indicate that, across different cultures, gamblers endorse comparable cognitive distortions, with disordered gamblers reporting more cognitive distortions than non-disordered gamblers.

Based on these findings, the GBQ appears to be a valid and reliable measure of gambling-related cognitive distortions. Steenbergh and colleagues (2002) suggested a possible role for the measure in monitoring treatment changes. However, to date, the measure has not been evaluated with a treatment-seeking sample of disordered gamblers. Consistent with previous studies, we predicted that the GBQ would demonstrate good psychometric properties in a treatment-seeking sample. Consistent with the presumed maintenance role of cognitive distortions in disordered gambling behavior, we predicted that GBQ scores would significantly decrease across treatment for disordered gambling. In this study, we assessed the internal consistency of the GBQ. Next, we evaluated the convergence of the GBQ with indices of gambling severity and the divergence of the measure with demographic variables. Given the research that shows that disordered gamblers hold more cognitive distortions and endorse these
distortions at a greater intensity, the factor of structure in a clinical sample needed to be confirmed. Finally, we examined the treatment sensitivity of the GBQ. Fulfilling these objectives should aid in the validation of the GBQ for clinical assessment.

**Method**

**Participants**

Participants were 170 individuals seeking services at an outpatient gambling treatment center. The majority of the sample was male (55.3%), Caucasian (67.6%), and married (47.6%). The average age was 45.5 years. See Table 1 for more details on participant demographics.

During the initial assessment, 92% \((n = 155)\) of participants reported on the types of gambling they engaged in within the past year. Participants all reported engaging in more than one type of gambling activity. The majority of the sample spent time as casino gamblers; 88.2% \((n = 150)\) had been to a casino at least once within the past year; 73.5% \((n = 125)\) reported going to the casino at least monthly. Slot machine gambling (83.5%, \(n = 142\)) followed by cards playing (58.2%, \(n = 99\)) were the most frequently endorsed gambling activities. Engagement in the following gambling activities was also endorsed: bets on animals (33.5%, \(n = 57\)), sports betting (19.4%, \(n = 33\)), dice games (32.9%, \(n = 56\)), lotteries (32.9%, \(n = 56\)), bingo (38.2%, \(n = 65\)), stock market (29.4%, \(n = 50\)), bets on games of skill (25.5%, \(n = 43\)), and Internet based betting (10.0%, \(n = 17\)). Nearly 13% of the sample reported engaging in eight or more types of gambling. See Table 2 for more details of past year gambling frequency rates.

Nearly all participants met the cut off for probable pathological gambling on the SOGS (97.6%; \(n = 166\)), and disordered gambling criteria on the DSM-Q (90.6%, \(n = 154\)). Overall, the severity of gambling related problems in this sample was much higher than is seen in a general population sample and is representative of a clinical sample experiencing severe
gambling difficulties. As evidence of the high level of gambling problem severity, on average participants in the sample were endorsing 2 more items than needed to meet DSM 5 gambling disorder criteria \( M = 6.4 \). Eleven percent of the sample reported experiencing all nine symptoms of gambling disorder.

Materials

The Gamblers’ Beliefs Questionnaire (GBQ). The GBQ was developed as a 21-item self-report instrument used to assess gambling-related cognitive distortions. Each item on the GBQ consists of a statement that represents a gambling specific cognitive distortion (e.g., “when I am gambling, ‘near misses' or times when I almost win remind me that if I keep playing I will win”). Respondents rate their level of agreement on a 7-point scale from strongly agree to strongly disagree. Higher total scores indicated greater cognitive distortions. A revised 20-item version of the English GBQ was used for this study. The original authors (Steenbergh et al., 2002) revised the measure based on item content consideration. A Spanish version of the 20-item measure showed good psychometric properties in a community sample (Winfree et al., 2013).

Demographic Questionnaire. This questionnaire assessed demographic characteristics including, gender, age, ethnicity, education, marital status, and monthly income.

South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). This 20-item self-report screening measure is based on the DSM III - criteria (American Psychiatric Association, 1980) and was designed to identify probable disordered gambling. SOGS items are concerned with gambling problems. At intake participants reported past year gambling problems and at follow up participants reported gambling problems experienced in the one-month since treatment had ended. Scores range from 0 to 20 with a score of 5 or greater indicating probable disordered gambling (Lesieur & Blume, 1987). In treatment-seeking samples, the measure demonstrated
adequate internal consistency (α = .86; Stinchfield, 2002), convergence with the DSM-IV criteria (r = .83; Stinchfield, 2002), and good test-retest reliability (r = .71; Leiseur & Blume, 1987).

**DSM Questionnaire (DSM Q; Shaffer et al., 1994).** This 12-item measure was designed to assess for DSM-IV disordered gambling criteria (American Psychiatric Association, 1994). The measure has shown adequate internal consistency with adolescents (α = 0.86; Shaffer et al., 1994) and substance abusers (α = 0.91; Shaffer, Freed, & Heala, 2002). At intake participants reported past year gambling symptomology and at follow up participants reported gambling symptomology experienced in the one-month since treatment had ended. Following the collection of data for this study, the DSM 5 reclassified disordered gambling to gambling disorder and redefined the diagnostic criteria. For the purpose of this study, the DSM-IV-Q was recoded post hoc to meet the DSM 5 standards. To do this, the item on the DSM-IV-Q related to illegal acts was removed (Petry, Blanco, Stinchfield, & Volberg, 2013). The range on this measure decreased to 0-9 and the threshold for number of items endorsed was lowered to a score of 4 or greater. Subsequent analyses utilize the DSM 5 scores and refer to the DSM-Q measure.

**Procedure**

Data was collected at an outpatient gambling treatment center where a battery of measures was administered pre- and one month post-treatment. The Internal Review Board approved use of this clinic database with all protected health information removed. At intake clients were asked to complete the GBQ as part of a larger initial assessment packet that included a demographic questionnaire, SOGS, and DSM-Q. At intake participants were asked to report their past year gambling problems on both the SOGS and the DSM-Q. Data from the initial assessment (n = 170) were used for the factor analysis, internal consistency evaluation, and
examining the convergent/divergent validity between the GBQ and indices of disordered gambling.

Treatment was delivered at an outpatient gambling treatment center and not part of a clinical trial. The cognitive-behavioral treatment including a decisional balance of gambling behavior, feedback about gambling, identifying antecedents and consequences of gambling, development of healthy gambling alternatives, and relapse prevention (for details see Whelan, Meyers, & Steenbergh, 2007). The therapeutic style employed during the intervention was motivational interviewing (Miller & Rollnick, 2013) and clients engaged in goal setting for their gambling. The five treatment phases are typically delivered in five to eight weekly sessions with length of treatment determined by a variety of reasons related to therapeutic need and exclusive of data collection purposes (Lipinski et al., 2007). Overall, clients completed an average of 5.32 session ($SD = 4.11$). As part of the standard therapy structure, clients were invited to the gambling treatment center within approximately one month of completing treatment and were administered the same questionnaire packet that was administered at baseline. At the follow up, clients were asked to report their rate of gambling problems during the past month since treatment ended for both the SOGS and the DSM-Q. This measurement was done to capture the remittance of symptoms. Of the 170 individuals completing the pre-treatment assessment, 37.6% ($n = 64$) returned to the treatment center to complete the one-month follow up assessment. This subsample was used to examine changes in GBQ scores from pre- to post-treatment. The subsample of participants who completed the one-month follow up assessment was significantly less likely to be female than those who did not complete the follow up assessment, $\chi^2 (1, n = 170) = 5.021, p < .05$, but was not significantly different on any other demographic variables or on measures of gambling symptomology. Data related to why an individual failed to participate
in the follow up data collection was not systematically collected, but included changing of phone
numbers and mailing addresses, failing to present for scheduled follow ups, and declining to
complete the assessment packet during follow-up sessions.

Results

Missing Data.

We followed the recommendation of Downey and King (1998) for removal of missing
data and imputation of missing items. Four participants were missing only 5% of GBQ data.
These participants’ missing responses were imputed using neutral response option for the item.

Internal Consistency.

The internal consistency of the GBQ scale was estimated using coefficient alpha
(Cronbach, 1951) and suggested good internal consistency ($\alpha = .87$).

Construct Validity.

Construct validity was assessed by examining the relationship between GBQ scores and
scores on two measures of disordered gambling. At baseline, the average GBQ score was 67.49
($SD = 19.94$). It is noteworthy that the clinical sample’s total GBQ score was markedly higher
and had a smaller range than previously reported in a community and undergraduate population
where the average GBQ score was 53.9 ($SD = 22.4$) (Steenbergh et al., 2002). Correlation
analyses revealed significant relations between the GBQ score and SOGS scores ($r = .21, p < .01$)
and DSM Q scores ($r = .19, p < .01$).

Construct validity was also assessed by examining the relationship between the GBQ
total score and demographic variables. As expected, correlation analyses revealed non-significant
associations among GBQ scores and age ($r < .01, p = .98$) and reported monthly income ($r = .09,
$p = .32$).
Confirmatory Factor Analysis.

GBQ data from the initial assessment was used for confirmatory factor analysis \((n = 170)\). Proc CALIS in SAS Stat Version 9.2 with maximum likelihood estimation was used to conduct analyses. In this study, three types of fit indices were used for model evaluation and comparison: (a) the Comparative Fit Index (CFI), (b) the Root Mean Square Error of Approximation (RMSEA), and (c), the Standardized Root Mean Square Residual (SRMR).

The CFI compares the fit of the model to a baseline model and varies along a continuum from 0 to 1, with estimates above .90 indicating an acceptable fit (Hu & Bentler, 1998). The RMSEA estimate incorporates a parsimony correction and is used prevalently in the factor analytic literature. An RMSEA estimate with a value close to .06 and less than .08 indicates a reasonable fit (Hu & Bentler, 1998). Finally, the SRMR index provides a measure of absolute fit, with a value less than .08 generally indicating acceptable fit (Hu & Bentler, 1998).

The first hypothesized model was a single factor model. According to the fit indices the single factor model provided a poor fit to the data, CFI = 0.69, RMSEA = .107, SRMR = .102. The second hypothesized model was a two-factor model with items split between the dimensions of Illusion of Control and Luck/Perseverance. This was chosen based on the two-factor structure reported in community populations (e.g., Steenbergh et al., 2002). The fit indices indicated that the two-factor model provided an improved but not adequate fit to the data, CFI = 0.76, RMSEA = .095, SRMR = .096. The standardized factor loadings are provided in Table 3.

Modification indices that could suggest alternative factor structures to explore were reviewed with caution due to concerns about creating a model that would not generalize to other samples or the overall gambling population (e.g. Hatcher, 1994). A review of Wald Test estimates did not conclusively suggest parameters for elimination. Lagrange Multiplier Indices
showed a pattern of large residuals, suggesting possible underlying sub-patterns to how some participants were responding. A closer examination of how the participants were responding to the GBQ items revealed that one of these patterns may be due to a restriction of range, where due to the high pathology rates of the sample, participants were overwhelmingly endorsing the majority of the cognitive distortions.

*Treatment Sensitivity.*

For the 64 treatment completers, changes in individuals’ scores on the GBQ over the course of treatment were explored. A one-tailed $t$-test for paired samples revealed that post-treatment GBQ scores ($M = 46.69$, $SD = 22.00$) were significantly lower than pre-treatment GBQ scores ($M = 71.20$, $SD = 20.52$), $t(126) = 6.52$, $p < .001$.

In addition, using one-tailed $t$-tests for paired samples, we examined changes in individuals’ gambling severity across the intervention. Post-treatment DSM-Q scores ($M = 1.39$, $SD = 2.13$) were significantly lower than pre-treatment DSM-Q scores ($M = 6.62$, $SD = 1.61$), $t(126) = 15.69$, $p < .001$. In addition, post-treatment SOGS scores ($M = 4.98$, $SD = 4.59$) were significantly lower than pre-treatment scores ($M = 12.00$, $SD = 3.78$), $t(126) = 9.44$, $p < .001$.

We also examined differences in post-treatment GBQ scores between treatment responders and non-responders. We identified treatment responders ($n = 56$) as those who did not meet criteria for probable disordered gambling criteria according to the DSM-Q and SOGS at post-treatment. Non-responders ($n = 8$) were identified as those who met DSM-Q and SOGS criteria for probable disordered gambling at post-treatment. An independent samples $t$-test revealed that treatment responders ($M = 43.98$, $SD = 20.19$) scored significantly lower on the GBQ than non-responders at post-treatment ($M = 65.63$, $SD = 26.15$), $t(64) = 2.73$, $p < .01$. 
**Baseline GBQ scores and treatment outcome.**

We also evaluated differences in baseline scores among those who completed the one-month follow up assessment and those who did not complete the one-month follow up assessment. An independent samples t-test revealed no significant difference in DSM-Q scores between those who completed treatment ($M = 6.62$, $SD = 1.60$) and those who did not ($M = 6.27$, $SD = 1.98$), $t(168) = -1.18$, $p = .24$. The same was found for SOGS scores of those who completed treatment ($M = 12.00$, $SD = 3.78$) and those who did not ($M = 11.62$, $SD = 3.76$), $t(168) = -0.63$, $p = .53$. Baseline GBQ scores were also not significantly different for those who completed ($M = 71.20$, $SD = 20.52$) and those who did not complete the follow up assessment ($M = 65.25$, $SD = 19.33$), $t(168) = 1.90$, $p = .059$.

No significant differences in pre-treatment GBQ scores were found among those who responded ($M = 70.65$, $SD = 19.57$) and did not respond ($M = 79.25$, $SD = 26.38$) to treatment, $t(62) = 1.19$, $p = .239$. The change in GBQ scores for treatment responders demonstrated a significant improvement with the pre-post change score of 27.67 exceeding the Reliable Change Index of 26.02, $d = 1.41$. The change in GBQ scores for those who did not respond was not significant, the pre-post change score of 13.62 did not exceed the Reliable Change Index of 35.07, $d = 0.52$ (Jacobson & Truax, 1991).

Next, hierarchical regressions were performed to evaluate the predictive utility of GBQ scores on treatment outcome. Pre-treatment GBQ scores did not significantly predict post-treatment SOGS scores, $R^2 = .01$, $F(1, 62) = .73$, $p = .40$ or post-treatment DSM-Q scores, $R^2 = .01$, $F(1, 62) = .63$, $p = .43$. 
Discussion

Existing evidence supports the role of gambling-related cognitive distortions in the development and maintenance of disordered gambling. The GBQ has served as a valid assessment tool for researchers and clinicians seeking to identify common cognitive distortions among gamblers across a range of diverse samples (Mackillop et al., 2006a, b; Mitrovic & Brown, 2009; Myrseth et al., 2010; Steenbergh et al., 2002; Winfree et al., 2013; Wohl et al., 2007). The current findings provide further support for the GBQ’s use with treatment-seeking disordered gamblers.

Consistent with previous research, the GBQ demonstrated high internal consistency. As expected, GBQ scores correlated significantly with scores on the two measures of disordered gambling, the SOGS and DSM-Q. Mackillop et al. (2006a) also found GBQ scores to be significantly associated with SOGS scores. The modest strength of these relationships was expected given the restricted range of scores on the DSM Q and SOGS and because cognitive distortions alone do not cause gambling problems. This lends support to the notion that the GBQ as a measure of cognitive distortions is related to, but not redundant with other measures of gambling disorder. GBQ scores did not significantly correlate with age and reported monthly income. This is consistent with the divergent validity test conducted by Steenbergh et al. (2002) that revealed no significant relation among GBQ scores and social desirability biases. Overall, these findings support the construct validity of the measure and also provide further support for the association between gambling-related cognitive distortions and disordered gambling (Goodie & Fortune, 2013).

Overall, treatment-seeking gamblers reported cognitive distortions at a higher rate than was found for non-disordered gamblers in a community sample, with average total GBQ score of
67.49 ($SD = 19.94$) in the former compared to scores of 53.93 ($SD = 22.40$) in the later. It does not appear that a particular pattern of gambling-related beliefs is more clearly present in treatment-seeking disordered gamblers, but instead it is the presence of multiple distortions that is most characteristic of pathology (Steenbergh et al., 2002). This is consistent with the cognitive theory of gambling presented by Ladouceur and Walker (1996) that suggests multiple gambling-related irrational beliefs correspond with the maintenance of problematic gambling behaviors. Additional support for the influence of multiple cognitive distortions in gambling pathology was reported by Steenbergh and colleagues (2002). They found that overall GBQ scores significantly corresponded to problematic gambling behavior but the two dimensions of Luck/Perseverance and Illusion of Control were not differentially predictive of degree of gambling related difficulties.

One explanation for the confirmatory factor analysis result is that gambling-related cognitive distortions may be operating differently for treatment-seeking disordered gamblers compared to community samples of gamblers. Previous analysis supported two dimensions: Luck/Perseverance and Illusion of Control (e.g., Steenbergh et al, 2002). Although related, these dimensions appeared to provide meaningful information about the thoughts people held when they gambled. Our failure to confirm these two factors drove our examination of the actual pattern of responses of individuals who met diagnostic criteria. Disordered gamblers in contrast with non-disordered gamblers appear to endorse more cognitive distortions and endorse them more strongly, regardless of whether the distortions have to do with money and time invested in gambling, superstitious beliefs, or illusion of control (e.g., Joukhador, MacCallum, & Blaszczynski, 2003). Alternatively, the previous research supporting the two dimensions was not replicated because they were not meaningful. Finally, it is possible that the failure to reveal the
two factors may be related only to those individuals presenting for treatment because they themselves identify the problem and the need for treatment.

This was the first study examining changes in GBQ scores across treatment for disordered gambling. GBQ scores were found to decrease significantly across a brief motivationally based cognitive-behavioral intervention. There was also a remittance of problem gambling symptoms that corresponded with treatment. These findings are consistent with evidence supporting the effectiveness of cognitive-behavioral therapy to decrease common cognitive distortions and are consistent with other studies that have reported significant decreases in cognitive distortion across treatment for disordered gambling (e.g., Sylvain et al., 1997). Our results are similar to findings from Doiron and Nicki (2007) who used the GBQ during a gambling prevention program for at-risk gamblers and found that scores significantly decreased across the intervention. In this study, we found that those who responded to treatment reported significantly lower GBQ scores as compared to those who maintained their disordered gambling status at post-treatment. Consistent with previous research (Toneatto & Gunaratne, 2009), these findings support that cognitive distortions are a meaningful construct related to treatment success.

Pre-treatment GBQ scores did not significantly predict post-treatment SOGS and DSM-Q scores. In addition, there were no significant baseline differences in GBQ scores between treatment responders and non-responders and those who completed the one-month follow up assessment and those who did not complete the follow up assessment. These findings suggest that baseline assessment of cognitive distortion level may not help predict treatment retention or gambling severity at post-treatment. For clinicians, the primary benefits of assessment of cognitive distortions include monitoring of decreases in overall and specific common cognitive
distortions. Of additional consideration is how previous research identified cognitive distortion level as a predictor of relapse among Gamblers Anonymous attendees (Oei & Gordon, 2008). Furthermore, higher scores on the luck items have been associated with greater enjoyment of gambling and more negative attitudes toward seeking treatment (Wohl, Young, & Hart, 2007). Further research is necessary to clarify the potential role of cognitive distortions on treatment retention and outcome.

Several limitations of this study should be considered. One-month follow up data was only available for a portion of the participants. Drop out rates could be related to participants experiencing natural recovery (Hodgins & El-Guebaly, 2000) before attending all phases of the treatment, but it is also possible that treatment did not seem promising for these participants. Alternatively, there is growing support for brief personalized motivational feedback sessions to significantly reduce gambling symptomatology (Larimer et al., 2012). Therefore, it is possible that participants attained a sufficient therapeutic benefit from the motivational feedback piece, or other components of treatment, early in the intervention and did not find it necessary to return for the one-month follow up assessment.

Another limitation may be that other cognitive distortions held by gamblers are not included on the current version of the measure (Fortune & Goodie, 2012). However, the GBQ appears to capture cognitive distortions that have the most supportive evidence: the gambler’s fallacy and illusion of control (Goodie & Fortune, 2013). The literature suggests that the gambler’s fallacy is the cognitive distortion most strongly associated with disordered gambling behavior (Goodie & Fortune, 2013).

Future research examining the meditational relation between cognitive distortions and gambling severity is warranted. It remains unclear when cognitive change occurred for this
sample. It would be informative to administer the GBQ across multiple points during an intervention to determine which phase(s) of treatment most strongly correspond to cognitive change. In addition, further research is needed to understand the pace of cognitive change versus the pace of behavior change during treatment. Additional research could also focus on the clinical interpretation of GBQ scores to aid in the identification of problematic levels of distortion. Finally, there is need for further investigation of the distortions most highly related to gambling severity, and distortion changes most associated with reduction in gambling severity.

The continued demonstration of the validity of cognitive assessment measures and their correspondence with efficacy of cognitive-behavioral therapy for disordered gambling supports their use in gambling treatment (Goodie & Fortune, 2013). The GBQ was developed to assist in treatment planning and case conceptualization, aid in cognitive restructuring interventions, and serve as a treatment outcome measure (Whelan, Steenbergh, & Meyers, 2007). This study provides validity support for use of the GBQ with disordered gamblers and shows changes in GBQ scores are related to therapeutic changes. Further evaluation of the measure with diverse populations of disordered gamblers is encouraged.
References


meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology*, 59(1), 12.


Table 1
Demographic characteristics of the total sample of treatment seeking gamblers

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<td>Married</td>
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<tr>
<td>Previously married</td>
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<td>33.6</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Did not respond</td>
<td>5</td>
<td>2.7</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Education</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
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<td>2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>High School/equivalent</td>
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<td>14.7</td>
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<tr>
<td>Graduate degree</td>
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<td>14.1</td>
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<tr>
<td>Did not report</td>
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<td>2.4</td>
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</table>
Table 2

Frequency of Past Year Gambling Involvement (n = 155)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not at all</th>
<th>Less than monthly</th>
<th>Monthly</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Cards</td>
<td>53</td>
<td>31.2</td>
<td>64</td>
</tr>
<tr>
<td>Animals</td>
<td>92</td>
<td>54.1</td>
<td>47</td>
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<td>Sports</td>
<td>119</td>
<td>70.0</td>
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<td>Dice</td>
<td>94</td>
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<td>Lottery</td>
<td>90</td>
<td>52.9</td>
<td>45</td>
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<tr>
<td>Bingo</td>
<td>87</td>
<td>51.2</td>
<td>57</td>
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<tr>
<td>Stock Market</td>
<td>102</td>
<td>60.0</td>
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<td>Slots</td>
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<td>7.6</td>
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<td>Games of Skill</td>
<td>108</td>
<td>63.5</td>
<td>32</td>
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</table>

*Note.* Participants who failed to indicate the frequency of which they gambled for an activity were excluded from the frequency count by item.
Table 3

Standardized Factor Loadings for GBQ-20

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<th>Item Number</th>
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<td>6</td>
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<tr>
<td>7</td>
<td>.39</td>
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<tr>
<td>20</td>
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</table>
Psychometric Evaluation of the Gamblers’ Beliefs Questionnaire with Treatment-Seeking Disordered Gamblers

Highlights:

- We evaluate the psychometric properties of the Gamblers’ Beliefs Questionnaire with a clinical sample of pathological gamblers.
- Cognitive distortion level decreased significantly across cognitive-behavioral intervention.
- Gamblers’ Beliefs Questionnaire scores correspond significantly with measures of gambling severity.
- Factor analytic data support a unique factor structure with clinical sample.
- The findings support validity of Gamblers’ Beliefs Questionnaire for clinical assessment.
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Contributors
All authors contributed to the study design and preparation of the manuscript. J. P. Whelan and A. W. Meyers supervised the data collection within the treatment clinic. W. R. Winfree and M. K. Ginley conducted literature searches and conducted statistical analyses. W. R. Winfree wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest
All authors report they have no conflicts of interest.

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