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THE LIE/BET QUESTIONNAIRE FOR SCREENING PATHOLOGICAL GAMBLERS: A FOLLOW-UP STUDY[1]

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Summary.—This study follows up one in which was derived a two-item screening questionnaire for pathological gambling. In the previous study, the two-item screening questionnaire had sensitivity of .99 and specificity of .91. In this study, testing 295 men (116 pathological gamblers and 179 controls) and 128 women (30 pathological gamblers and 98 controls), sensitivity was 1.00 and specificity .85. In the previous study, the predictive value of a positive result was .92 and of a negative result .99. In this sample, the predictive value of a positive result was .78 and of a negative result 1.00. These results indicate the two questions represent a useful screening device for a DSM-IV diagnosis of pathological gambling.

Gambling is a widespread and growing activity. A consistent finding in a series of American, Canadian, and British studies is that over 8% of adults approve of gambling practices and that two out of three adults participate regularly in some form of gambling (Ladouceur, Dube, & Bujold, 1994). In 1974, 61% of Americans gambled, spending $17.4 billion (Kallick, Suits, Dielman, & Hybels, 1979). By 1992, the amount had reached $329.9 billion, a 19-fold increase (Christiansen, 1993). A finding of a recent survey of college students from two Minnesota universities was that 87% had participated in gambling at least once in the previous year (Winters, Bengston, Dorr, & Stinchfield, 1998). Murray (1993) stated in a review that estimates of the number of pathological gamblers in the United States vary between 1.1 and 6 million. Recent data on 3004 adults in St. Louis, Missouri, indicated 9.2% of the sample were problem gamblers (Cunninghamwilliams, Cottler, Compton, & Spitznagel, 1998). Wolkowitz, Roy, and Doran (1985) noted that even the conservative estimates of addictive gambling exceed the prevalence of schizophrenia, and Lesieur (1994) pointed out that most epidemiological surveys probably have seriously underestimated the extent of problem and pathological gambling.

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Seelig and Seelig (1998) have identified four factors which have shifted gambling from its role as a private pastime into the center of the public agenda in Canada: (1) the public sector's active participation in gambling, both as a promoter of lotteries, casinos, and raffles, and as a regulator of these activities; (2) addiction, crime, and other problems associated with gambling; (3) gambling's rapid proliferation, which has made it a major factor in many provincial budgets; and (4) the extent to which public endeavors, including cultural institutions and amateur sport, are funded through gambling. These factors are observable also in the United States. The increased access to various sophisticated forms of gambling and access to incredible sums of money and credit have contributed to pathological gambling as a serious public health problem which cannot be ignored.

Three well-known tools for screening gambling behavior are the 16-item South Oaks Gambling Screen (Lesieur & Blum, 1987), the Gamblers Anonymous Twenty Questions (1984), and the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition criteria of the American Psychiatric Association (1994). Volberg (1994) and Lester (1994) found that, when availability of gambling is increased, the prevalence of gambling-related problems in the general population is increased. The rise in opportunities to gamble can be expected to result in growing numbers of pathological gamblers; likewise, the demand for more rapid identification also can be expected to increase. Thus a screening tool more brief than any of the foregoing inventories could be useful.

A two-item screening inventory for pathological gambling was described by Johnson, Hamer, Nora, Tan, Eisenstein, and Engelhart (1997). The items were selected from a 12-item questionnaire that was derived from the DSM-IV criteria for pathological gambling. Subjects were 362 men, 191 classified as pathological gamblers and 171 controls exhibiting no problems with gambling. Criteria for inclusion in the pathological gambler group were membership in Gamblers Anonymous and no more than seven negative responses to the Gamblers Anonymous Twenty Questions. A stepwise logistic regression with cross-validation performed on the responses identified two items that maximally differentiated the two groups in terms of sensitivity and specificity and in positive and negative predictive value. The two items that discriminated dependably between pathological gamblers and controls were DSM-IV (6) Have you ever had to lie to people important to you about how much you gambled? and DSM-IV (3) Have you ever felt the need to bet more and more money?

The pathological gamblers were recruited from Gamblers Anonymous groups throughout the country, while the controls were recruited from Department of Veterans Affairs employees and volunteers. All subjects participated voluntarily and had to read at the outset a description of the study,

which included the aim of the study and the method of gathering data. Each participant completed a Demographic Information Form, the Gamblers Anonymous Twenty Questions, and a 12-item Gambling Questionnaire adapted from the diagnostic criteria for pathological gambling listed in the Diagnostic and Statistical Manual of Mental Disorders (4th edition).[2]

A serious limitation of the initial study was that only men were subjects, so significant generalizability was lost. The aim of this study was to replicate the original design and to include women. Of the total sample of 423 subjects, 295 were men and 128 women. Involved were 146 members of Gamblers Anonymous who gave no more than seven negative responses to the Gamblers Anonymous Twenty Questions, and 277 controls. As proposed by Johnson, *et al.* (1997), responses to a test of DSM-IV Questions 3 and 6 were used to classify the sample into predicted pathological gamblers and predicted nonpathological gamblers.

Using the full sample, Questions 3 and 6 were combined to obtain the sum of the number of yes responses. Given that there are two questions, there can be 0, 1, or 2 responses. The results of placing a cut-off at any nonzero response are reported in Table 1.

TABLE 1
FREQUENCIES USED IN COMPUTING OPERATING CHARACTERISTICS OF THE LIE/BET QUESTIONNAIRE

Test	Disease State	
	Positive	Negative
Initial Study		
Positive	True Positive: 190	False Positive: 16
Negative	False Negative: 1	True Negative: 155
Sensitivity	= TP/(TP + FN) = 190/191 = .99	
Specificity	= TN/(TN + FP) = 155/171 = .91	
Positive Predictive Value	= TP/(TP + FP) = 190/206 = .92	
Negative Predictive Value	= TN/(TN + FN) = 155/156 = .99	
Follow-up Study		
Positive	True Positive: 146	False Positive: 42
Negative	False Negative: 0	True Negative: 235
Sensitivity	= TP/(TP + FN) = 146/146 = 1.00	
Specificity	= TN/(TN + FP) = 235/277 = .85	
Positive Predictive Value	= TP/(TP + FP) = 146/188 = .78	
Negative Predictive Value	= TN/(TN + FN) = 235/235 = 1.00	

Frequencies used in computing operating characteristics of the Lie/Bet Questionnaire for the initial and follow-up study are presented in Table 1 wherein "Disease State" is group, either gamblers (positive) or controls (neg-

[2]The 12-item questionnaire will be supplied by the first author on request.

ative); "Test" is positive if either Question 3 or Question 6 was answered affirmatively and negative otherwise; TP indicates true positive, FP false positive, FN false negative, and TN true negative. A true positive is a problem gambler whom the test identified as a problem gambler; a true negative is a nonproblem gambler whom the test identified as a nonproblem gambler; a false positive is a nonproblem gambler whom the test classified as a problem gambler; and a false negative is a problem gambler whom the test classified as a nonproblem gambler. In the table is a listing of the obtained values for sensitivity, specificity, positive predictive value, and negative predictive value.

The sensitivity of .99 in the initial study means that of the 191 people who were pathological gamblers, the test classified all but one as Pathological Gamblers; the sensitivity of 1.00 obtained in the follow-up study means that of the 146 people who met the criteria for pathological gamblers, the test classified all 146 of them as Pathological Gamblers. The specificity of .91 in the initial study means that of the 171 people who were controls, the test classified 155 as Nonpathological Gamblers; again, the specificity of .85 means that of the 277 people who were controls, the test classified 235 as Nonpathological Gamblers. The positive predictive value of .92 in the initial study means that of the 206 people the test scores classified as Pathological Gamblers, 190 were in fact pathological gamblers, while the follow-up finding of a positive predictive value of .78 indicates that of the 188 people the test classified as Pathological Gamblers, 146 were in fact pathological gamblers. The initial negative predictive value of .99 means that of the 156 people whom the test scores classified as Nonpathological Gamblers, 155 were in fact not pathological gamblers; the negative predictive value of 1.00 in the follow-up study means that of the 235 people test scores classified as Nonpathological Gamblers, all 235 of them were in fact not pathological gamblers. Thus, in both studies the sensitivity, specificity, and positive and negative predictive values differentiated Pathological from Nonpathological Gamblers with good accuracy.

The relationship between sex and the gambling variables was analyzed. The two sexes differed in the proportions of those classified as pathological gamblers. Of the 295 male responders, 116 (39.3%) were pathological gamblers, while 30 of the 128 female responders (23.4%) were pathological gamblers. The two sexes differed significantly (Fisher Exact two-tailed $p = .05$). The pattern for the predicted pathological gambling score, composed of the responses to DSM-IV Questions 3 and 6, was similar. In both instances the items differentiated pathological from nonpathological gamblers with high accuracy [$\chi^2 = 9.04$ ($p = .05$) for DSM-IV Question 3 and 11.52 ($p = .05$) for DSM-IV Question 6].

In both the initial and follow-up studies, the Lie/Bet screen had very high sensitivity and fairly high specificity. The predictive values of both posi-

tive and negative test results depend not only on sensitivity and specificity, but also on the prevalence of the disease in the population to which the test is applied. In the first study, the prevalence of the disease was 191/(191 = 171) = 1.52, while in the second study, (prevalence was 146/(146 = 277) = 1.34. The lower prevalence of the diagnosis in the second study causes the decrease in the predictive value of a positive result. The Negative Predictive Value of 1.00 obtained in the follow-up study means that all of the people who achieve a negative result on the Lie/Bet screen are in fact not problem gamblers; the initial study differed from this outcome by a nonsignificant .01.

An important limitation of this research noted in the initial study remains, i.e., there is no totally accurate way of deciding which participant may be denying problem gambling. The possibility of such denial is unavoidable. All subjects clearly were self-selected.

In conclusion, the high sensitivity, specificity, and positive and negative predictive values obtained in both the initial and follow-up studies and the significantly high accuracy with which the two items differentiated pathological from nonpathological gamblers indicate that the Lie/Bet Questionnaire is a useful tool for screening pathological gamblers.

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