research

The South Oaks Gambling Screen (SOGS): A rebuttal to critics

Blasé Gambino, Boston, Massachusetts, USA.
E-mail: blasegambinophd@aol.com

Henry Lesieur, Rhode Island Hospital, Providence, Rhode Island, USA

Abstract

A review of the literature reveals strong support for the construct validity of interpretations based on scores obtained with the original and more recent versions and/or variants of the South Oaks Gambling Screen (SOGS). Criticisms of the SOGS are shown to lack merit, to be offset by more important criteria, or to be no longer relevant. The evidence reviewed indicates that the construct of pathological gambling as represented by the SOGS and its variants provides a robust definition and implies that the SOGS meets the important criterion of validity generalization. The construct of chasing and behaviors related to chasing is shown to provide powerful measures by which to discriminate between the presence and absence of pathological gambling. The viability of the SOGS to continue to make important contributions to the understanding of pathological gambling is discussed in terms of the criteria for selecting a research instrument.
Key words: construct validity, validation strategies, validity generalization, diagnostic criteria, pathological gambling, South Oaks Gambling Screen, SOGS

Introduction

The South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987) has been the subject of a number of critical reviews (e.g., Battersby, Thomas, Tolchard, & Esterman, 2002; Gerstein et al., 1999; Shaffer & Korn, 2002; Volberg, 1999; Walker & Dickerson, 1996), beginning with Culleton's analysis of methods (1989). This has led to calls for replacement of the SOGS as the primary research instrument used in prevalence studies of the general population.

Although Lesieur (1994) and Gambino (1997) have provided responses to some of the issues, it is clear that a more detailed response is needed. Our goal is to demonstrate that the SOGS remains an important and viable choice among current alternatives by arguing the case that the major criticisms lack merit, are outweighed by other criteria, or are simply no longer relevant.

The SOGS is a 20-item instrument initially developed to screen clinical populations, for example, substance abusers, for the presence of pathological gambling. Responses to the 20 items are summed, and endorsement of 5 or more items is interpreted as evidence of the presence of pathological gambling. Criteria from the DSM-III and DSM-III-R were used in the development of the SOGS; the interested reader will find the original validation data in Lesieur and Blume (1987). The first use of the SOGS as a screen to detect pathological gambling in the general population was by Volberg and Steadman (1988). It is impossible in a short report to do justice to a review of the SOGS. We have therefore limited our response

to what we believe are the most relevant and important issues. A more detailed report by the second author is available by request at hlesieur@lifespan.org. This includes an extensive list of references through early 2003 and a set of summary tables. In part, the criticisms leveled at the SOGS reflect the scarcity of systematic reviews and evaluation of the literature, i.e., meta-analysis. The references compiled by the second author should provide an excellent starting point for those investigators planning such analyses.

A brief review

A wide selection of validation strategies have been employed to demonstrate the validity of the SOGS. These include the use of single-stage (e.g., Gambino, 1997; Poulin, 2002) and multiple-stage (e.g., Abbott & Volberg, 1996; Abbott, Williams, & Volberg, 1999; Gambino, 1999a) designs, a description of the mathematical models for evaluating the accuracy of estimates based on these designs (Gambino, 1997, 1999a), and methods for evaluating the precision and cost-efficiency of these designs (Gambino, 1999b). Other investigators have employed statistical modeling techniques for the purpose of validation, including factor analysis (e.g., Winters, Stinchfield, & Fulkerson, 1993), logistic regression (e.g., Poulin, 2002; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001), Rasch analysis (Strong, Lesieur, Breen, Stinchfield, & Lejuez, 2004), and stratification analysis (e.g., Tavares, Zilberman, Beites, & Gentil, 2001).

Evidence supporting the psychometric soundness of the SOGS, while less extensive than evidence that supports the validity of the many applications of the SOGS, continues to be accumulated (e.g., Abbot & Volberg, 1996; Lesieur & Blume, 1987; Stinchfield, 2002; Winters et al., 1993). These include measurement of internal validity (e.g., Stinchfield & Winters, 2001; Volberg, 2002; Welte et al., 2001), the use of concurrent validation strategies (e.g., Doiron & Nicki, 2001; Westphal & Johnson, 2000), postdictive or retrospective criterion validity (e.g., Gambino, Fitzgerald, Shaffer, Renner, & Courtnage, 1993; Ladouceur, Jacques, Giroux, Ferland, & Leblond, 2000), and the use of convergent and discriminant validation strategies (e.g., Lesieur & Blume, 1987; Stinchfield, 2002). Convergent validity as demonstrated by the correlation between the SOGS and its variants with the DSM, both earlier and current versions, is impressive in its consistency and ranges from moderate (e.g., Sproston, Erens, & Orford, 2000) to high (e.g., Welte et al., 2001). These correlations hold for both clinical (Stinchfield & Winters, 2001) and general (Stinchfield, 2002) population samples as well as comparisons among both adult and adolescent versions (e.g., Volberg, 1996, 1998).

Much of the criticism of the SOGS has its roots in the failure to recognize what qualify as statements of validity (Gambino, 2003a). For example, the proposed relationships between pathological gambling and frequency of gambling (e.g., Hing & Breen, 2001), duration of gambling (e.g., Wong, McAuslan, & Bray, 2000), distance to gambling (e.g., Gerstein et al., 1999), and expenditures on gambling (Cox, Kwong, Michaud, & Enns, 2000), are *all statements of construct validity* (Cronbach, 1988). Recent epidemiologic studies have provided additional support by employing the SOGS to measure the strength (relative risk) and magnitude (attributable risk) of the relation of pathological gambling to suspected indicators of enhanced risk such as age, adults versus adolescents; severity, clinical versus general populations (e.g., Shaffer, Hall, & Vanderbilt, 1997); and comorbidity, e.g., substance use disorders (e.g., Feigelman, Wallisch, & Lesieur, 1998).

Several investigators have used the SOGS to search for the putative causes of pathological gambling in terms of genetic (e.g., Walters, 2001) or neurobiological (e.g., Ibáñez, Blanco, de Castro, Fernandez-Piqueras, & Saiz-Ruiz, 2003) factors; track its natural history (e.g., Shaffer & Korn, 2002); and measure the progression from gambling onset to diagnosis of pathological gambling (e.g., Tavares et al., 2001). Others have employed the SOGS to examine the construct of pathological gambling from a theoretical perspective, e.g., the debate over whether to view pathological gambling as an obsessive-compulsive or addictive disorder (Frost, Meagher, & Riskind, 2001).

If pathological gambling lies on a continuum of severity (Shaffer & Korn, 2002), then strong support for the validity of the SOGS would be found by showing that predictions of pathological gambling, in terms of the likelihood that a specific score discriminates the pathological from the nonpathological gambler, should increase as scores on the SOGS increase. Evidence in support of the SOGS is presented in Table 1 employing the likelihood ratio (LR). The LR is a measure recommended by clinical epidemiologists for validating clinical indicators and instruments (Kraemer, 1992). LRs can be used to validate individual clinical indicators, diagnostic and screening tests, or a range of test scores. The interested reader will find more detailed descriptions elsewhere (Chu, 1999; Koch, Capurso, & Llewelyn, 1995; Kraemer, 1992; McGee, 2000; Sackett, Haynes, & Tugwell, 1991; Schmitz, Kruse, & Tress, 2000; Zhou, Obuchowski, & McClish, 2002).

The LR provides an empirical measure of the goodness of a test definition (or individual criterion) by defining the odds of finding a particular test result in those with versus those without the disorder. It is this *difference* of frequency of occurrence that is looked for when assessing the validity of a symptom, sign, or test result (Koch et al., 1995). It measures the degree of certainty with respect to the diagnosis being confirmed. Larger values for the LR are interpreted as indicative of greater certainty that the presumptive diagnosis is correct; i.e., one may have greater confidence in the diagnosis. Values of LR equal to one mean that the results have no diagnostic value, and values of LR less than one indicate that the disorder is less likely to be present.

The LR is defined as the true-positive rate (sensitivity) divided by the false-positive rate (1 – specificity). Estimates of sensitivity and specificity were obtained following well-established procedure (Zhou et al., 2002). Sensitivity was estimated by assuming that gamblers in treatment represent individuals known to have the disorder; specificity was estimated by assuming that gamblers from the general population represent individuals free of the disorder. These are surrogate definitions since there will be some probability that some gamblers in the general population will be false negatives and some probability that some gamblers in treatment will be false positives. The use of these two populations as surrogates is reasonable since the analysis assumes that these labels apply on average, and not in any individual case (Schlesselman, 1982). This form of validation is equivalent to correlating test items with the total score. The LR provides an empirical estimate of the power of an instrument, one or more items, or a range of scores to discriminate the pathological gambler from the nonpathological gambler. The LR is interpreted as a measure of the credibility of the instrument or item(s) in accounting for the empirical evidence (Clayton & Hills, 1996).

Table 1, based on a reanalysis of Stinchfield's data (2002), provides evidence to support this view and demonstrates that the SOGS meets this strong criterion for validity as indicated by increasing estimates of the LR with increasing scores on the SOGS.

Table 1
LRs based on general population and gambling treatment samples

Score on SOGS	Se	1 − Sp	LR
> 0	1.00	.159	6.49
> 1	.996	.066	15.09
> 2	.991	.043	23.04
> 3	.988	.028	35.28
> 4	.985	.017	57.92
> 5	.976	.013	75.04
> 6	.948	.008	118.5
> 7	.893	.006	148.83
> 8	.841	.001	841
> 9	.765	.000	∞

Se = sensitivity, based on responses of treatment sample (*N* = 327); 1− Sp = 1 − specificity, based on responses of general population sample (*N* = 845); LR = Se/(1 − Sp).

The evidence clearly demonstrates support for the validity of the SOGS as an instrument for research on both clinical and general population samples (e.g., Volberg, 1994), its usefulness in case finding in clinical (e.g., Petry & Armentano, 1999) and correctional settings (Walters, 1997), the identification and testing of hypotheses about the determinants of pathological gambling (e.g., Cox et al., 2000; Gambino et al., 1993), and its usefulness in evaluating treatment outcomes (e.g., Stinchfield & Winters, 2001) and tracking long-term changes in prevalence rates among adults (Volberg & Moore, 1999) and adolescents (Winters, Stinchfield, Botzet, & Anderson, 2002), among others.

In sum, the SOGS has been employed for a multitude of purposes, in a wide array of settings, with diverse populations and cultures, and has been translated into at least 36 languages for use on six continents (contact the second author for a list of SOGS translations). These studies have found consistent replicable relationships between pathological gambling, as measured by the original and revised versions of the SOGS; personal attributes across times, places, communities, and clinical settings; and comparison with other instruments. The consistency of these findings provides strong support for the construct validity of the SOGS (e.g., Beaudoin & Cox, 1999; Hodgins & el-Guebaly, 2000).

Our review of the evidence in support of the validity of the SOGS is not presented as an argument that efforts to develop alternatives are misguided. Indeed, the continuing appearance of studies designed to validate improved alternatives is to be encouraged and represents a welcome challenge (e.g., Cunningham-Williams & Cottler, 2001; Fisher, 2000; Gerstein et al., 1999; Smith & Wynne, 2002; Stinchfield, Govoni, & Frisch, 2001). Comparisons among alternative instruments will continue to help identify the strengths and weaknesses in contrasting and related views on how to define the construct of pathological gambling; it may be expected that the SOGS will continue to contribute to this important task.

Criticisms of the SOGS

The initial evaluation. The criticism that the SOGS was validated on clinical samples, thus making invalid its application to the general population, was reasonable, but it should not

have been implicitly accepted in the absence of support for or against the application's validity. The apparent unquestioning acceptance of this criticism represents a failure to understand that it is not the test that is being validated, but inferences and conclusions based on test score interpretations (Rubin, 1988). This criticism has subsequently been shown to be unwarranted in view of the strong support for the construct validity of findings employing the SOGS and its variants in studies of the general population. More specifically, recent research has validated the SOGS with general population samples in a number of settings and cultures (e.g., Abbott & Volberg, 1996; Volberg, Abbott, Ronnberg & Munck, 2001; Stinchfield, 2002; Volberg & Vales, 1998

Items on the SOGS. An additional set of criticisms revolve around the specific items on the SOGS, particularly its emphasis on borrowing. Table 2 presents an analysis of the 20 SOGS items, based on the data reported by Stinchfield (2002), that rebuts this criticism. The primary measure employed in Table 2 is the LR described earlier. An interpretation of the LR

Table 2
LRs based on general population (1 – Sp) and gambling treatment (Se) samples

SOGS item	Se	1 – Sp	LR[a]
Cashed in stocks	17.0	0.0	∞
Borrowed from loan sharks	5.0	0.0	∞
Borrowed money and not paid them back	52.0	0.1	520.0
Borrowed from banks	40.0	0.1	400.0
Sold personal or family property	35.0	0.1	350.0
Lost time from work	49.0	0.2	245.0
Felt like you wanted to stop but didn't think you could	81.0	0.4	202.5
Borrowed from relatives or in-laws	48.0	0.4	120.0
Borrowed from checking account	54.0	0.5	108.0
Had money arguments centered on gambling	64.0	0.6	106.7
Felt you had a problem	91.0	0.9	101.1
Hid betting slips	74.0	0.9	82.2
Borrowed from credit cards	44.0	0.7	62.9
Borrowed household money	70.0	1.2	58.3
Went back another day to win back money (chasing)	80.0	1.4	57.1
Borrowed from spouse	33.0	0.6	55.0
Criticized by others for your gambling	83.0	3.0	27.7
Felt guilty	90.0	3.7	24.3
Gambled more than you intended	92.0	5.5	16.7
Claimed to be winning money gambling but weren't	52.0	4.5	11.6

Se = sensitivity, based on responses of treatment sample (N = 327); 1 – Sp = 1 – specificity, based on responses of general population sample (N = 845) of gamblers who did not meet criterion; LR = Se/(1 – Sp).

has been provided by Jaeschke, Guyatt, and Sackett (1994). These investigators propose the following interpretive guidelines: greater than 10 (large, often conclusive), 5 to 10 (moderate), 2 to 5 (small but sometimes important), and 1 to 2 (small, rarely important). The data show clearly that exceptionally high LRs were obtained for all items.

Two findings are of special interest. First, chasing as defined in the Stinchfield (2002) study (Table 2) is a strong discriminant (LR = 57.1) for separating pathological and nonpathological gamblers. Second, the five most discriminative items and seven of the top ten were items assessing borrowing. In view of the importance of the concept of chasing as a major characteristic of the pathological gambler (Lesieur, 1984) and the obvious relationship between chasing and the need to obtain money to chase, the discriminatory power of items on borrowing should not be surprising. These results provide additional strong support for the concepts embedded in the SOGS.

It needs to be emphasized that not all forms of borrowing discriminate between pathological and nonpathological gamblers; only forms of borrowing that discriminate between these two groups were included in the original SOGS (second author). It has been suggested that a better alternative is to replace the questions on borrowing with an omnibus question. The above analysis indicates that this may be expected to result in the generation of false-positive responses. In a similar vein, analysis of DSM-IV (first author), employing the validation results reported by Stinchfield et al. (2001), revealed that while chasing was the second most endorsed item (88%) by gamblers in treatment, slightly less than preoccupation (91%), it was the second poorest discriminant (LR = 12.1), reflecting the high proportion of nonpathological gamblers who endorsed this item (7.3%).

Lesieur (1984) has noted the importance of the distinction between short-term chasing, which is common among regular gamblers, and long-term chasing, which is not. In addition, research conducted for the original SOGS (contact the second author) found chasing "most of the time" after losses effectively discriminated, while chasing "less than half the time" the gambler lost did not! Accordingly, "less than half the time I lost" is not given a point in the SOGS while "more than half the time" is accorded a point in the 20-item screen. It is critical for researchers to take care to properly word the item to reflect this important distinction. Failure to do so will, as in the case of using an omnibus question on borrowing described above, generate additional false-positive responses.

Changing criteria. Arguments that the changing nature of the definition of pathological gambling has invalidated the SOGS are not persuasive. First, the lack of a gold standard for pathological gambling leaves unanswered the question, on what basis is the replacement of one set of criteria, e.g., DSM-III, DSM-III-R, with another definition, e.g., DSM-IV, justified? Recent examples of debate over the changing of diagnostic criteria that illustrate the issues include acute myocardial infarction (e.g., Pell et al., 2003) and diabetes mellitus (e.g., Borch-Johnson & Vej, 1998). The question of replacing old criteria with new criteria is an important one, but remains a difficult one to resolve due to the lack of accepted standards for evaluation (Zhou et al., 2002).

Second, the selection of which criteria to validate is typically the result of agreement by a panel of experts (Koch et al., 1995). The problems with the use of experts to establish diagnostic criteria have been detailed elsewhere (Kupfer & Regier, 2002), but in the main reflect the lack of rigorous diagnostic standards and the biases inherent in subjective judgments. Additional problems facing the experts include such factors as the historical lack

of funding to support a series of rigorous validation studies (e.g., Cunningham-Williams & Cottler, 2001; Zhou et al., 2002), the lack of a consensus on a conceptual model of pathological gambling (e.g., Walker & Dickerson, 1996), and limitations imposed by the amount and quality of extant research available for evaluation (e.g., Lesieur & Rosenthal, 1991).

Liberal versus conservative estimates. A related issue is the argument that the SOGS provides more liberal estimates than DSM-IV. This argument is misleading for three reasons. First, it implies that DSM-IV estimates are more accurate, i.e., valid, than the SOGS, or that those gamblers identified by DSM-IV are somehow more clinically relevant. In the absence of a gold standard, and in the face of such evidence as the ability of the items on the SOGS to discriminate true positives from false positives, neither implication can be justified.

Second, the emphasis on crude prevalence rates is misplaced (Gambino, 2003b). Crude prevalence rates are always a function of stratum-specific rates, e.g., gender differences, and will always overestimate some stratum-specific rates, e.g., females, and underestimate others, e.g., males. Stratum-specific rates are generally more informative for the purposes of identifying risk determinants, planning interventions such as screening programs, and designing prevention programs (Abramson, 1996).

Finally, stratum-specific rates may be converted into measures of relative risk and attributable risk percent (Shaffer et al., 1997). The use of these measures provides a means of comparing instruments (e.g., the SOGS and DSM-IV) that has the advantage of being independent of crude prevalence rates. For example, if the rates for males and females are 4% and 2%, respectively, using SOGS, but only 2% and 1% using DSM-IV, the relative risks will be two to one for both instruments while attributable risk percent will be $(2 – 1)/2 \times 100 = 50\%$ (Gambino et al., 1993).

The use of lifetime measures. The argument that only lifetime measures are used is no longer relevant; researchers now routinely employ current measures of prevalence, such as 6-month (Abbott & Volberg, 1991), past-year (Welte et al., 2001), and lifetime prevalence rates (Volberg, 1994). This argument was based, in part, on the failure of lifetime measures to discriminate between current cases and those in remission. The additional argument that lifetime measures are of no practical value is based on a misunderstanding. Lifetime measures are of limited use unless tied directly to age-specific strata; otherwise they cannot be properly interpreted (Abramson, 1996). Lifetime measures remain important indicators of the potential burden on the community; for example, with the advent of Internet gambling, former pathological gamblers may be more susceptible to relapse in the context of this medium. Under these conditions, the use of current estimates would clearly underestimate the potential burden in the community. An additional issue, often overlooked, is that sensitivity will decrease and specificity will increase as the time frame for measurement decreases (Gambino, 2005). This serves to mitigate the original argument, based on lifetime measures, that the SOGS generates too many false positives (Culleton, 1989; Dickerson, 1993; Shaffer & Korn, 2002). It should also be emphasized that the original false-positive criticism (Culleton, 1989) rested on an invalid premise and is by extension an invalid argument (Gambino, 1997).

Choosing an instrument. Finally, and we believe most important, the choice of instrument should not be based *solely* on the most recent diagnostic criteria. There are a number of reasons to select a specific research instrument (Gambino, 1997). These include replication,

comparability, knowledge of the properties and performance of the instrument under specific conditions, the goals of the study, the interests of the researcher, or simply the preference of funding sources (Robins, 1995).

Discussion

Validity refers to the usefulness of interpretations of test scores as these are applied for a specific purpose (Messick, 1988). This view is credited to Vernon (1963) and raises an important issue. As Kline observes, "a truly scientific psychometric test would be valid *per se* [author's italics], that is, for all purposes to which the test might legitimately be put" (2000, p. 34). A strict interpretation of the specificity argument states that changing one word or one question creates the need for a new validation study.

This may be true in the technical sense, but has not been found to hold in practice where consistent relations between scores on the SOGS and indicators of enhanced risk have emerged. The consistency and replicability of the observed relationships with different forms of the SOGS indicate that the general construct of pathological gambling as represented by the SOGS and its variants is robust. This implies that the validity of the SOGS is generalizable across situations, settings, samples, variants, and versions. Validity generalization (Schmidt & Hunter, 1998) has received strong endorsement in the most recent revision of the standards for testing as an important measure of support for validity (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999) and is the subject of a recent edited volume (Murphy, 2003). Considering the time, costs, and resources needed to conduct each new validation study, this robustness of the SOGS is a valuable asset.

For example, investigators may take advantage of the robustness of the SOGS to improve future versions by amending those items that show moderate to low levels of discrimination between gamblers in treatment (true positives) and gamblers in the general population (false positives). The relatively high proportions of false positives for the last four items in Table 2 suggest the need to reword these items to make them more specific. For example, the item most frequently endorsed by gamblers in treatment (92%), "gamble more than you intended," was also endorsed by 5.5% of gamblers from the general population. This question might be reworded, following Lesieur's (1984) recommendation on defining chasing, in terms of the frequency of occurrence of this behavior, e.g., more than half the time (positive) versus less than half the time (negative), in order to better discriminate true positives from false positives.

We emphasize that our defense of the SOGS does not imply any argument that the SOGS *must* or *should* be used instead of, or in place of, DSM-IV or other instruments. That would be not only an unrealistic position, but one without merit. The issue that faces the clinician or researcher is "how to choose among the riches" (Robins, 1995, p. 243). The case we have sought to make is that it is premature to reject the SOGS, particularly in view of the projected publication of DSM-V in 2010 or later (Kupfer et al., 2002). To do so would result in the loss of valuable information about the relations we study.

A more productive strategy is to supplement the SOGS (DSM-IV), when feasible (e.g., budget constraints), with a second test, e.g., DSM-IV (SOGS) (e.g., Volberg, 1996; Welte et al., 2001). This has a number of advantages, such as permitting the investigator to obtain

estimates of test accuracy in the form of measures of sensitivity and specificity (Gambino, 1999a). It also provides a bridge between the SOGS, DSM-IV, and the transition to DSM-V by helping to establish a solid foundation of validated knowledge based on multiple tests, i.e., convergent validation. An example is the use of the SOGS together with criteria from DSM-III-R and DSM-IV to develop and validate a new scale for the purposes of measuring the severity of pathological gambling (Koeter, de Fuentes-Merillas, Schippers, & van den Brink, 2003).

We close with three observations. First, "it is important to build on the foundation of work already done" (Volberg, 1999, p. 40). Second, the use of the SOGS has served researchers well in their study of pathological gambling and its correlates; it should continue to do so when applied to those situations in which conditions support its relevance and usefulness, e.g., replicability of previous research based on the SOGS. Since the majority of prior studies have been conducted employing variants of the SOGS, this is a particularly important criterion for choice of instrument.

Our third and final observation is a historical one. The original intent of Lesieur and Blume in development of the SOGS (1987) was its application to the screening of substance abusers for the presence of pathological gambling. The historical, social, and economic factors that resulted in the overwhelming selection of the SOGS as the instrument of choice over the last 18 years could not have been anticipated. With hindsight and evidence in hand, however, it would appear that the choice was clearly a productive one in terms of knowledge gained. We need only point to the many studies employing the SOGS, or one of its variants, that appeared in the final report by the National Research Council on pathological gambling (Committee on the Social and Economic Impact of Pathological Gambling, 1999).

References

Abbott, M., & Volberg, R. (1991).
Gambling and problem gambling in New Zealand. Report on phase one of the national survey (Research Series No. 12). Wellington, New Zealand: Department of Internal Affairs.

Abbott, M., & Volberg, R. (1996).
The New Zealand national survey of problem and pathological gambling. *Journal of Gambling Studies, 12,* 143–160.

Abbott, M.W., Williams, M., & Volberg, R.A. (1999).
Seven years on: A follow-up study of frequent and problem gamblers living in the community. Wellington, New Zealand: Department of Internal Affairs.

Abramson, J.H. (1996).
Cross-sectional studies. In W.W. Holland, R. Detals, & G. Knox (Eds.), *Methods in public health* (pp. 517–535). Oxford: Oxford University Press.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999).
Standards for educational and psychological testing. Washington, DC: American Educational Research Association.

Battersby, M.W., Thomas, L.J., Tolchard, B., & Esterman, A. (2002).

The South Oaks Gambling Screen: A review with reference to Australian use. *Journal of Gambling Studies, 18,* 257–271.

Beaudoin, C.M., & Cox, B.J. (1999).
Characteristics of problem gambling in a Canadian context: A preliminary study using a DSM-IV-based questionnaire. *Canadian Journal of Psychiatry, 44,* 483–487.

Borch-Johnson, K., & Vej, N.S. (1998).
Will new diagnostic criteria for diabetes mellitus change phenotype of patients with diabetes? Reanalysis of European epidemiological data. *British Medical Journal, 317,* 371–375.

Chu, K. (1999).
An introduction to sensitivity, specificity, predictive values and likelihood ratios. *Emergency Medicine, 11,* 175–181.

Clayton, D., & Hills, M. (1996).
Statistical models in epidemiology. New York: Oxford University Press.

Committee on the Social and Economic Impact of Pathological Gambling, National Research Council (1999).
Pathological gambling: A critical review. Washington, DC: National Academy Press.

Cox, B.J., Kwong, J., Michaud, V., & Enns, M.W. (2000).
Problem and probable pathological gambling: Considerations from a community survey. *Canadian Journal of Psychiatry, 45,* 548–553.

Cronbach, L.J. (1988).
Five perspectives on validity argument. In H. Wainer & H.I. Braun (Eds.), *Test validity* (pp. 3–17). Hillsdale, NJ: Laurence Erlbaum.

Culleton, R.P. (1989).
The prevalence rates of pathological gambling: A look at methods. *Journal of Gambling Behavior, 5,* 22–41.

Cunningham-Williams, R.M., & Cottler, L.B. (2001).
The epidemiology of pathological gambling. *Seminars in Clinical Neuropsychiatry, 6,* 155–166.

Dickerson, M. (1993).
A preliminary exploration of a two-stage methodology in the assessment of the extent and degree of gambling-related problems in the Australian population. In W.R. Eadington & J.A. Cornelius (Eds.), *Gambling behavior and problem gambling.* Reno, NV: University of Nevada, Reno.

Doiron, J.P., & Nicki, R.M. (2001).
Epidemiology of problem gambling in Prince Edward Island: A Canadian microcosm? *Canadian Journal of Psychiatry, 46*, 413–417.

Feigelman, W., Wallisch, L., & Lesieur, H.R. (1998).
Problem gamblers, problem substance users, and dual-problem individuals: An epidemiological study. *American Journal of Public Health, 88,* 467–470.

Fisher, S. (2000).
Measuring the prevalence of sector-specific problem gambling: A study of casino patrons. *Journal of Gambling Studies, 16,* 25–51.

Frost, R.O., Meagher, B.M., & Riskind, J.H. (2001).
Obsessive-compulsive features in pathological lottery and scratch-ticket gamblers. *Journal of Gambling Studies, 17,* 5–19.

Gambino, B. (1997).
The correction for bias in prevalence estimation with screening tests. *Journal of Gambling Studies, 13,* 343–351.

Gambino, B. (1999a).
An epidemiologic note on verification bias: Implications for estimation of rates. *Journal of Gambling Studies, 15,* 223–232.

Gambino, B. (1999b).
Estimating confidence intervals and sampling proportions in two-stage prevalence designs. *Journal of Gambling Studies, 15,* 243–245.

Gambino, B. (2003a).
On construct validity and construct validation. Boston, MA: Massachusetts Council on Compulsive Gambling.

Gambino, B. (2003b).
Reflections on accuracy: A commentary. Boston, MA: Massachusetts Council on Compulsive Gambling.

Gambino, B. (2005).
Interpreting prevalence estimates of pathological gambling: Implications for policy. *Journal of Gambling Issues, 14.* Available at http://www.camh.net/egambling/issue14/jgi_14_gambino.html

Gambino, B., Fitzgerald, R., Shaffer, H.J., Renner, J., & Courtnage, P. (1993).
Perceived family history of problem gambling and scores on the SOGS. *Journal of Gambling Studies, 9,* 1699–184.

Gerstein, D., Hoffman, J., Larison, C., Murphy, S., Palmer, A., Chuchro, L., et al. (1999).
Gambling impact and behavior study. Report to the National Gambling Impact Study Commission. Chicago: NORC.

Hing, N., & Breen, H. (2001).
An empirical study of sex differences in gambling machine play amongst female club members. *International Gambling Studies, 1,* 67–86.

Hodgins, D.C., & el-Guebaly, N. (2000).
Natural and treatment-assisted recovery from gambling problems: A comparison of resolved and active gamblers. *Addiction, 95,* 777–789.

Ibáñez, A., Blanco, C., de Castro, I.P., Fernandez-Piqueras, J., & Saiz-Ruiz, J. (2003).
Genetics of pathological gambling. *Journal of Gambling Studies, 19,* 11–22.

Jaeschke, R., Guyatt, G.H., & Sackett, D.L. (1994).

Evidence-based medical working group. User's guide to the medical literature. III. How to use an article about a diagnostic test. B. What are the results and will they help me in caring for patients? *Journal of the American Medical Association, 271,* 703–707.

Kline, P. (2000).
The new psychometrics. London: Routledge.

Koch, M., Capurso, L., & Llewelyn, H. (1995).
Analyzing the discriminating power of individual symptoms, signs and test results. In H. Llewelyn & A. Hopkins (Eds.), *Analyzing how we reach clinical decisions* (pp. 51–67), London, UK: Royal College of Physicians of London.

Koeter, M.J.W., de Fuentes-Merillas, L., Schippers, G.M., & van den Brink, W. (2003).
Severity of gambling addiction: Development of a new assessment instrument. *World Psychiatry, 2,* 6 (Supplement 1).

Kraemer, H.C. (1992).
Evaluating medical tests: Objective and quantitative guidelines. Newbury Park, CA: Sage.

Kupfer, D.J., & Regier, D.A. (2002, May).
A research agenda for DSM V. Program and abstracts of the American Psychiatric Association 155th Annual Meeting, Symposium 25, Philadelphia, PA.

Ladouceur, R., Jacques, C., Giroux, I., Ferland, F., & Leblond, J. (2000).
Analysis of a casino's self-exclusion program. *Journal of Gambling Studies, 16,* 453–460.

Lesieur, H.R. (1984).
The chase: Career of the compulsive gambler. Cambridge, MA: Schenkman Books.

Lesieur, H.R. (1994).
Epidemiological surveys of pathological gambling: Critique and suggestions for modification. *Journal of Gambling Studies, 10,* 385–398.

Lesieur, H.R., & Blume, S.B. (1987).
South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144,* 1184–1188.

Lesieur, H.R., & Rosenthal, R.J. (1991).
Pathological gambling: A review of the literature (prepared for the American Psychiatric Association Task Force on DSM-IV Committee on Disorders of Impulse Control Not Elsewhere Classified). *Journal of Gambling Studies, 7,* 5–39.

McGee, S. (2000).
Simplifying likelihood ratios. *Journal of General Internal Medicine, 17,* 646–649.

Messick, S. (1988).
The once and future issues of validity: Assessing the meaning and consequences of measurement. In H. Wainer & H.I. Braun (Eds.), *Test validity* (pp. 33–45). Hillsdale, NJ: Laurence Erlbaum.

Murphy, K.R. (Ed.). (2003).

Validity generalization: A critical review. St. Paul, MN: Assessment Systems Corporation. Available at http://www.assess.com/Books/b-41148.htm

Pell, J.P., Simpson, E., Rodger, J.C., Finlayson, A., Clark, D., Anderson, J., et al. (2003).
Impact of changing diagnostic criteria on incidence, management, and outcome of acute myocardial infarction: Retrospective cohort study. *British Medical Journal, 326,* 134–135.

Petry, N., & Armentano, C. (1999).
Prevalence, assessment, and treatment of pathological gambling: A review. *Psychiatric Services, 50,* 1021–1027.

Poulin, C. (2002).
An assessment of the validity and reliability of the SOGS-RA. *Journal of Gambling Studies, 18,* 67–93.

Robins, L.N. (1995).
How to choose among the riches: Selecting a diagnostic instrument. In M.T. Tsuang, M. Tohen, & G.E.P. Zahner (Eds.), *Textbook in Psychiatric Epidemiology* (pp. 243–252). New York: Wiley-Liss.

Rubin, D.B. (1988).
Discussion. In H. Wainer & H.I. Braun (Eds.), *Test validity* (pp. 241–256). Hillsdale, NJ: Laurence Erlbaum.

Sackett, D.L., Haynes, R.B., & Tugwell, P. (1991).
Clinical epidemiology: A basic science for clinical medicine. Boston: Little Brown.

Schlesselman, J.J. (1982).
Case-control studies. New York: Oxford University Press.

Schmidt, F.L., & Hunter, J.E. (1998).
The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin, 124,* 262–274.

Schmitz, N., Kruse, J., & Tress, W. (2000).
Application of stratum-specific likelihood ratios in mental health screening. *Social Psychiatry & Psychiatric Epidemiology, 35,* 375–379.

Shaffer, H.J., Hall, M.N., & Vanderbilt, J. (1997).
Estimating the prevalence of disordered gambling in the United States and Canada: A meta-analysis. Boston, MA: Division on Addictions, Harvard Medical School.

Shaffer, H.J., & Korn, D.A. (2002).
Gambling and related mental disorders: A public health analysis. *Annual Review of Public Health, 23,* 171–212.

Smith, G.J., & Wynne, H.J. (2002).
Measuring gambling and problem gambling in Alberta. Final Report. Edmonton, AB: Alberta Gaming Research Institute.

Sproston, K., Erens, B., & Orford, J. (2000, June).
A comparison of two problem gambling screens: Results from the first British gambling prevalence survey. Paper presented at the 11th International Conference on Gambling and Risk Taking, Las Vegas.

Stinchfield, R. (2002).
Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). *Addictive Behaviors, 27,* 1–19.

Stinchfield, R., Govoni, R., & Frisch, G.R. (2001, November).
An evaluation of diagnostic criteria for pathological gambling: Final report. Windsor, ON: University of Windsor.

Stinchfield, R., & Winters, K. (2001).
Outcome of Minnesota's gambling treatment programs. *Journal of Gambling Studies, 17,* 217–245.

Strong, D.R., Lesieur, H.R., Breen, R.B., Stinchfield, R., & Lejuez, C.W. (2004).
Using a Rasch model approach to examine the utility of the SOGS screen across pathological and nonpathological gamblers. *Addictive Behaviors, 29,* 465–481.

Tavares, H., Zilberman, M.L., Beites, F.J., & Gentil, V. (2001).
Brief communications. Gender differences in gambling progression. *Journal of Gambling Studies, 17,* 151–159.

Vernon, P.E. (1963).
Personality assessment. London: Methuen.

Volberg, R.A. (1994).
The prevalence and demographics of pathological gamblers: Implications for public health. *American Journal of Public Health, 84,* 237–241.

Volberg, R.A. (1996, July).
Gambling and problem gambling in New York: A 10-year replication survey, 1986 to 1996. Albany, NY: New York Council on Problem Gambling.

Volberg, R.A. (1998, March).
Gambling and problem gambling among adolescents in New York. Albany, NY: New York State Council on Problem Gambling.

Volberg, R.A. (1999).
Research methods in the epidemiology of pathological gambling: Development of the field and directions for the future. *Annuário de Psicologia, 30,* 33–46.

Volberg, R.A. (2002, March).
Gambling and problem gambling among adolescents in Nevada. Report to the Nevada Department of Human Resources. Northampton, MA: Gemini Research.

Volberg, R.A., & Moore, W.L. (1999).
Gambling and problem gambling in Washington State: A replication study, 1992 to 1998. Olympia, WA: Washington State Lottery.

Volberg, R.A., & Steadman, H.J. (1988).

Refining prevalence estimates of pathological gambling. *American Journal of Psychiatry, 145,* 502–505.

Volberg, R. A., & P. A. Vales. (1998).
Gambling and problem gambling in Puerto Rico [Juegos de azar y el problema de juego en Puerto Rico]. Report to the Puerto Rico Treasury Department.

Volberg, R.A., Abbott, M.W., Ronnberg, S., & Munck, I.M. (2001).
Prevalence and risks of pathological gambling in Sweden. *Acta Psychiatrica Scandinavica, 104*, 250–256.

Walker, M.B., & Dickerson, M.G. (1996).
The prevalence of problem and pathological gambling: A critical analysis. *Journal of Gambling Studies, 12*, 233–249.

Walters, G.D. (1997).
Problem gambling in a federal prison population: Results from the South Oaks Gambling Screen. *Journal of Gambling Studies, 13,* 7–24.

Walters, G.D. (2001).
Behavior genetic research on gambling and problem gambling: A preliminary meta-analysis of available data. *Journal of Gambling Studies, 17,* 255–271.

Welte, J.W., Barnes, G.M., Wieczorek, W.F., Tidwell, M., & Parker J. (2001).
Alcohol and gambling among U.S. adults: Prevalence, demographic patterns and comorbidity. *Journal of Studies on Alcohol, 62*, 706–712.

Westphal, J.R., & Johnson, L.J. (2000, June).
Is problem gambling a distinct state? Paper presented at the 11th International Conference on Gambling and Risk Taking, Las Vegas.

Winters, K., Stinchfield, R., Botzet, A., & Anderson, N. (2002).
A prospective study of youth gambling behaviors. *Psychology of Addictive Behaviors, 16,* 3–9.

Winters, K., Stinchfield, R., & Fulkerson, J. (1993).
Toward the development of an adolescent gambling problem severity scale. *Journal of Gambling Studies, 9,* 63–84.

Wong, P., McAuslan, P., & Bray, B. (2000).
Survey of problem gambling in the metropolitan Detroit area, 2000. Report prepared for the United Way Community Services. Dearborn, MI: University of Michigan—Dearborn.

Zhou, X.H., Obuchowski, N.A., & McClish, D.K. (2002).
Statistical methods in diagnostic medicine. New York: John Wiley & Sons, Inc.

Manuscript history: Submitted April 15, 2005, accepted: March 16, 2006. All URLs were active at the time of submission.

For correspondence: Blasé Gambino, PhD, 10 Ellet Street, Suite 314, Boston, Massachusetts, USA 02122. Phone: (617) 282-2560, fax: (617) 426-4555,

e-mail: blasegambinophd@aol.com

Contributors: Both authors contributed equally to this paper.

Competing interests: For GB, none declared. HL is one of the co-authors of the SOGS.

Ethical approval: None required.

Funding: Not applicable.

Blasé Gambino (PhD, experimental psychology, University of Massachusetts at Amherst) has studied addiction science and addiction practice since the publication of *Theory and Practice in the Addictions* (1979) with co-author Howard Shaffer. Among other publications, he was co-editor of *Compulsive Gambling: Theory, Research and Practice* (1989), to which he contributed a chapter on the development of prescriptive interventions through applying the principles of clinical epidemiology. He serves on the editorial review board of the *Journal of Gambling Studies*. He has contributed articles on mathematical models to eliminate bias in prevalence estimation research for single- and two-stage prevalence designs and articles on the epidemiology of pathological gambling and the evaluation of the outcomes of training programs in pathological gambling for employee assistance programs. His current interests are in the epidemiology of pathological gambling and the validation of alternative screening and diagnostic test instruments for pathological gamblers.

Henry R. Lesieur (PhD, sociology, University of Massachusetts, Amherst, in 1976, and PsyD in clinical psychology, Massachusetts School of Professional Psychology, in 2001, and postdoctorate studies at Brown University) is a staff psychologist at Rhode Island Hospital in Providence and a clinical psychologist in the Rhode Island Gambling Treatment Program. Dr. Lesieur is a member of the Board of Directors of the National Council on Problem Gambling and President of the Rhode Island Council on Problem Gambling, as well as being on the advisory board of other organizations. He and Sheila Blume, MD, are co-authors of the South Oaks Gambling Screen. Dr. Lesieur has run workshops and given numerous professional presentations on problem gambling and addictions. E-mail: Hlesieur@lifespan.org

issue 17 — august 2006

camh
Centre for Addiction and Mental Health
Centre de toxicomanie et de santé mentale

Editorial Contact: phil_lange@camh.net
Subscribe to our automated announcement list: gamble-on@lists.camh.net
Unsubscribe: gamble-off@lists.camh.net