GRP

Gambling Research Panel

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Validation of the Victorian Gambling Screen

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About the research team

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Professor Jan McMillen is Director of the ANU Centre for Gambling Research (Research School of Social Sciences). Prior to her appointment to ANU in 2003, she was Australia's first professor of gambling research and Director of the Australian Institute for Gambling Research (UWS, 1997-2003). She has also been a regulator appointed to two independent Gaming Commissions (Victoria 1991-93 and Queensland 1991-2002).

Jan McMillen has established a national and international reputation in the analysis of gambling policy and regulation, the study of gambling impacts and social policy. She has conducted multidisciplinary gambling research in all Australian states/territories, using a wide range of research methods, including large surveys of gambling participation and community attitudes, and problem gambling prevalence studies. She also established and edits the *International Gambling Studies* journal, distributed by commercial publishers Taylor and Francis.

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Dr Eliza Ahmed has 15 years of professional experiences in teaching (statistics and methodology) and doing empirical research in psychology. She has extensively used sophisticated statistical analyses in her research on rule violation and the processes of regulation. Eliza also has consulting experience in gambling research. Dr Ahmed is currently Research Fellow at the ANU Centre for Tax System Integrity (Research School of Social Sciences).

Foreword

The Gambling Research Panel commissioned this report, *Validation of the Victorian Gambling Screen 2003*, under the 2001–2002 research plan as a follow-on from recommendations in its report *Measuring Problem Gambling: Evaluation of the Victorian Gambling Screen, June 2003.*

This report evaluates the measurement qualities and validity of a new problem gambling screen, the Victorian Gambling Screen (VGS), specifically developed for the Australian context in research dating back to 1997. Since that time, international developments in prevalence measurement have introduced new instruments, in particular the Canadian Problem Gambling Index. This research set out to validate the Victorian Gambling Screen (VGS) on a larger population sample and to evaluate it against the South Oaks Gambling Screen 5+ (SOGS5+) and the Canadian Problem Gambling Index (CPGI).

This validation study is based on data from a statewide survey of 8,479 Victorian residents conducted in April-May 2003. After screening for involvement in gambling, the population was divided into three groups, regular gamblers, non-regular gamblers and non-gamblers. Only the regular gamblers were administered one of the three problem gambling screens. The VGS was applied to one group (n= 149); the CPGI to another group (n= 143) and the SOGS was applied to the remaining group (n=143).

On this research, the CPGI out-performed other screens. It is shorter and more economical to administer, more robust and has been used interstate and internationally as an alternative to SOGS. Use of an international measure such as the CPGI would enhance comparability across jurisdictions.

Readers are reminded that the main aim of this study was cross validation of the three screens, since developing a new measure would be an expensive and time consuming exercise. This led to a range of methodological decisions with this aim in mind. In reading the problem gambling prevalence rates in this study, the standard errors of estimate suggest caution. Also, the application of gambling prevalence screens only to regular gamblers (defined as those who gambled at least weekly or 52 times per year, in gambling activities other than lottery games or instant scratch tickets) may have excluded others who gamble less frequently but for whom gambling is nevertheless problematic.

The measurement of problem gambling is a complex area and prevalence screens applied across whole populations are only one measure of relevance to problem gambling. Prevalence screens may be more useful for signalling those who may need help rather than qualifying other concerns, such as the impact of problem gambling or harm to self, family or the broader community.

The Panel thanks the research team of the Australian National University for its work on this project and special thanks go to Professor Jan McMillen, Dr David Marshall, Dr Eliza Ahmed and Dr Michael Wenzel. Thanks also goes to ACNeilsen for work on the survey design and implementation.

Associate Professor Linda Hancock
Chair, Gambling Research Panel

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Terms of Reference

This report is a result of research commissioned by the Gambling Research Panel (GRP) with the objective to:

- Identify and report on changing patterns of gambling participation and perceptions in Victoria since the *Seventh Survey of Community Gambling Patterns and Perceptions* was conducted for the Victorian Casino and Gaming Authority (VCGA) in November 1999;

- Identify and report on changes in the prevalence of problem gambling, and community perceptions of the consequences of problem gambling, in Victoria since 1999;

- Incorporate three problem gambling screens — South Oaks Gambling Screen (SOGS5+), the Canadian Problem Gambling Index (CPGI) and Victorian Gambling Screen (VGS) — into the community survey to allow cross-validation tests of the three screens; and

- Make recommendations to guide future research into gambling patterns and community perceptions.

Validation of the Victorian Gambling Screen is an evaluation of the measurement qualities and validity of the Victorian Gambling Screen[1] (VGS), a problem gambling screen developed for large population surveys in an Australian context. The VGS has not previously been tested on a large population sample.

The report presents the findings of the validation study, based on data from a statewide survey of 8,479 Victorian residents conducted in April and May 2003. These survey findings are reported separately in the *2003 Victorian Longitudinal Community Attitudes Survey*.

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[1]   Ben-Tovim, D., Esterman, A., Tolchard, B. and Battersby, M. 2001. *The Victorian Gambling Screen*, Report prepared for the Victorian Casino and Gaming Authority, published by the Gambling Research Panel.

Executive Summary

This report is a result of research commissioned by the Gambling Research Panel (GRP) to, firstly, identify current gambling patterns and perceptions and, secondly, evaluate the Victorian Gambling Screen.

The first research requirement was addressed in the *2003 Victorian Longitudinal Community Attitudes Survey* while this report, *Validation of the Victorian Gambling Screen,* addresses the second requirement.

Background to research and methodology

The survey was conducted as a representative survey of the Victorian adult population and provided data from 8,479 respondents. A selected random sampling procedure ensured that a sufficient number of regular gamblers was included to whom a problem gambling screen could be administered. In total, 506 respondents were identified as regular gamblers (weighted $n = 525$, or 6.2 per cent).

Three problem gambling screens were used in parallel: one screen each for a random sub-sample of regular gamblers. The study thus allowed a comparative evaluation of three screens: the Victorian Gambling Screen (VGS), the Canadian Problem Gambling Index (CPGI) and the South Oaks Gambling Screen (SOGS, version 5+).

The SOGS has been the dominant problem gambling screen in Australia and internationally, and has been used in numerous gambling studies. It has the advantage of being an established instrument for which comparative figures exist. However, it has been criticised for reasons including its underlying clinical theoretical model of problem gambling. As a response, the CPGI was developed in Canada and the VGS in Australia for application to general population surveys.

Both the CPGI and the VGS claim to be built on a definition of problem gambling in terms of harm — harm to self, others and the wider community. The VGS also was supposed to better accommodate the specific socio-cultural context in Australia. While the CPGI has been used in a number of population surveys — in Canada, Denmark and Iceland and in a recent population survey in Queensland — the VGS has not been used before on a larger scale; the only evidence of the screen's validity is based on a limited pilot study.

Evaluation of problem gambling screens raises a number of conceptual issues about:

- The purpose of the screen — in this Victorian study, the primary objective was an empirical estimation of problem gambling prevalence in the general population;

- The period of prevalence — in the present study, one year;

- The theory of problem gambling — for the VGS this has been conceptualised in terms of personal and social harm;

- Discrete or continuous measurement — in this study, measured on a continuous scale, but classified by the degree of problem/harm for easier communication of findings; and

- Response formats — in the present study the original response formats of the three screens were used for their specific cut-off definitions and a unified response format was used for comparisons of measurement qualities of the screens.

The Victorian survey involved three randomly chosen sub-groups of regular gamblers being subjected to one of three problem gambling screens. This procedure was realistic given the research budget, and probably more acceptable to survey participants than testing each respondent against all three screens, and thus helped maintain a satisfactory response rate. The procedure allowed an evaluation of the performances of the three screens in comparison with each other. However, it meant that interrelations between screens, which are one indicator of construct validity, could not be investigated. Construct validity was instead assessed by other means.

Validation tests and results

A content analysis of the three screens showed that the VGS (scoreable items) include two behavioural concepts that are not represented in either the CPGI or the SOGS, namely 'preoccupation' and 'escapism'. In contrast, the VGS does not contain items on 'habituation' (represented in the CPGI) or 'personal consequences' (represented in both the CPGI and SOGS). Moreover, three out of four 'social consequences' items in the VGS are not scoreable.

The three screens are largely similar in the various facets of problem gambling they cover (except for a stronger emphasis on borrowing money in SOGS). The scoreable 'harm to self' scale in the VGS covers a variety of facets but not 'personal consequences' and is therefore a misnomer. In addition, 'social consequences' are currently excluded from the scoreable items of the VGS, so that the screen is at odds with the presumed theoretical model in terms of harm.

An investigation of the distribution of responses per item showed that for most items in all three screens responses were highly skewed and relatively few regular gambler respondents responded affirmatively. This partly reflects that problem gambling is found only in a relatively small proportion of the general population. However, our analysis (of mean scores and standard deviations) showed that responses by regular gamblers were generally more often affirmative and showed greater variation for CPGI and VGS items than for the SOGS, indicating better measurement and differentiation properties.

Factor analyses were used to test the dimensionality of the problem gambling screens, that is, whether screen items measure a single or multiple concepts. Results for the VGS showed:

- A three-factor solution which only partly replicated findings from the VGS pilot study — the distinction between 'harm to self' and 'harm to others' was not found in this study;

- A strong main factor on which all items loaded substantially except items on 'enjoyment of gambling'; and

- For scoreable items ('harm to self'), evidence supported a single factor and uni-dimensionality.

For the CPGI a single factor emerged which suggests that these items measure a single dimension and can thus be aggregated into a single score for problem gambling. For the SOGS, six factors were extracted; and while there was a strong first factor, not all items loaded sufficiently on that factor. This suggests that the items in SOGS measure multiple concepts, rather than a single notion of problem gambling.

Correspondingly, analyses of internal consistency (i.e. the degree of interrelatedness between scale items) showed that both VGS and CPGI (scoreable items in each) are very homogenous and highly consistent scales, that the relationships between items in these two screens are more consistent than SOGS.

To assess the construct validity of the screens (i.e. whether what the screens measure behaves like the theoretical construct of problem gambling), correlative relationships between screen scores and correlates of problem gambling such as wanting help, stress and depression were investigated:

- The VGS scores showed significant relationships to all correlates;

- The VGS score was most strongly related to the 'self-rating of gambling problem' and 'wanting help';

- Overall, the CPGI showed the closest relationships to theoretical correlates of problem gambling and the SOGS the weakest.

Using the established cut-off scores for the three screens that define problem gambling (VGS: 21+, based on the pilot study; CPGI: 8+; SOGS: 5+), cross-tabulations with problem gambling correlates were investigated to assess classification validity: That is, do the problem gambling screens with their established cut-off scores validly distinguish between problem and non-problem gamblers?

We reasoned that validly classified problem gamblers should be more likely to show theoretically correlated behaviours such as 'wanting help'. A greater proportion of people classified as problem gamblers who do not show the behavioural correlate would indicate a greater problem of 'false positive' classification. A greater proportion of people classified as non-problem gamblers who do show the behavioural correlate would indicate a greater problem of 'false negative' classification. However, because the correlates are not true 'gold standards' for the classification as problem gamblers, they allow at best a comparative (but not absolute) assessment of 'false positive' and 'false negative' decisions (which are thus put in inverted commas):

The VGS showed greater rates of:

- 'False positives' (a classification as problem gambler that is inconsistent with the correlate) than the CPGI, while the VGS rate is equal to SOGS;

- 'False negatives' (a classification as non-problem gambler that is inconsistent with the correlate) than both the CPGI and the SOGS.

Cut-off scores for problem gambling

Based on the 2003 survey data, an inspection of the estimated prevalence rates of problem gambling in Victoria showed the:

- VGS estimated a one-year prevalence of 0.74 per cent (with a cut-off of 21+) and 1.28 per cent (with a cut-off score of 14+);

- CPGI (8+) estimated a one-year prevalence of 0.97 per cent;

- SOGS (5+) estimated a one-year prevalence of 1.22 per cent.

Both the weak result for classification validity and the relatively low estimate of problem gambling prevalence, when a cut-off of 21+ was used, suggest problems for the VGS in terms of the definition of suitable cut-off scores.

Further analyses were conducted to provide empirical indications and justifications for a re-definition of cut-off scores for the VGS:

- Analysis of the VGS score distribution suggested sub-groups of regular gamblers that can be separated by cut-offs of 9 and 15 (and perhaps 5 and 20 as well);

- An optimisation of criterion-related sensitivity (minimisation of 'false negatives') and specificity (minimisation of 'false positives') yielded a cut-off of 16 for a narrowly defined criterion and 5 or 6 for an inclusively defined criterion;

- A revised test for classification validity yielded an improved result for a cut-off of 15+ or 16+ compared to a cut-off of 21+, with the result being slightly superior for 15+;

- The estimated prevalence rate based on a VGS cut-off of 15+ was 1.22 per cent, which happened to be exactly the same as for the SOGS.

Although the analyses of classification validity need to be viewed with caution because no truly external classification criterion was available in this research, the results suggest problems with the definition of cut-off scores for VGS. The estimates of problem gambling prevalence corroborate this conclusion. Thus, further improvements of the VGS would have to focus on the adjustment of cut-off scores. The present survey data provided convergent evidence for a VGS cut-off score of 15+ for the definition of problem gambling.

General conclusions

The results of our validation tests for SOGS indicate that it is an unsatisfactory instrument to measure the prevalence of problem gambling in the general population. We recommend that the SOGS be replaced as the screen of choice in future Victorian and Australian population surveys.

Overall, the VGS performed fairly well and seems to be an improvement over the SOGS — specifically in terms of one-dimensionality, internal consistency, item distributions and, to some degree, construct validity. At the same time, it should be noted that the content of the VGS and its implicit meaning of problem gambling do not seem to differ very much from the SOGS, contrary to claims of a departure from that theoretical model.

Moreover, the CPGI demonstrated at least equally good qualities on all these dimensions, plus better classification validity. Overall the CPGI demonstrated the best measurement properties of all three gambling instruments investigated in this study.

This raises the question of whether more effort and resources should be invested in further refinements of the VGS; and whether indeed the VGS or the CPGI should be utilised in future Australian prevalence surveys. The nine-item problem gambling score of the CPGI is shorter and thus more economical to administer than the VGS; the CPGI has also become the screen of choice in a growing number of jurisdictions. On balance, our analysis suggests that the CPGI could be adopted as a problem gambling screen for general use in Australian population surveys.

Like the VGS, the CPGI is a relatively new screen and is currently being refined to accommodate the findings from several completed Canadian studies. If the CPGI is to be endorsed as a national gambling screen in Australia, it is essential to establish close collaboration with Canadian researchers to keep up-to-date with this process and to participate in further modifications to the screen.

As well as the essential questions about screen validity, however, issues for future consideration are:

- The consequences for longitudinal studies and trend analysis if a different screen is adopted than has been used in past surveys;

- Selection of an instrument which is most likely to be used in all Australian states/territories and internationally, and thus to provide meaningful comparisons; and

- Whether any of the existing instruments do in fact represent an appropriate understanding of problem gambling, or whether further development and refinement of their present content facets are required.

Problem Gambling — General Issues

In its 1999 national survey, the Productivity Commission found that problem gamblers are an 'heterogeneous group' and gambling problems 'emanate from a multiplicity of environmental, social and psychological facets'. In this view, now widely accepted in Australia and countries such as Canada, gambling can occur along a continuum ranging from no problems (most people) to moderate problems (a minority of gamblers — 1.1 per cent in the Productivity Commission's national survey) to severe problems (a small group — 1 per cent).[2]

Significantly, the Productivity Commission found no psychological factors or psychiatric conditions predisposing an individual to problem gambling. This contrasts with the then predominant view in the United States, New Zealand and many other countries that problem, 'addictive' or 'pathological' gambling is a psychiatric disorder or mental illness, identifiable by clinical tests (e.g. Diagnostic and Statistical Manual — DSM)[3] which differentiate problem gamblers from other gamblers.

In this regard, it is critical to note that the development of problem gambling may follow multiple pathways.[4] In some cases, social gamblers exercise a series of repeated poor judgements that result in excessive losses and associated harmful consequences. The resulting harm may be a one-off episode, intermittent and/or of short duration. This harm may be interpreted to meet the criteria for a gambling-related problem but it does not necessarily mean that the individual is suffering a gambling problem or that formal assistance or assistance is warranted or needed. These individuals are able to quickly recognise the potential for the development of further problems if they persist and therefore cease or reduce levels of gambling on their volition, with information and advice from family members, through self-help educational material or through brief assistance from community support agencies.

Others form an emotional dependence on gambling and gamble persistently as a means of dealing with external difficulties, personal distress and depression, or gambling forms part of a biologically-based impulsive personality. Such individuals experience immense difficulty in controlling their urge to gamble and require intensive and continued counselling.

In a proportion of cases, the problem gambling is a secondary manifestation of another psychological or psychiatric disorder, for example, a manic-depressive illness. In these situations, treatment for problem gambling is not warranted or needed on the assumption that the management of the primary psychiatric diagnosis will lead to a reduction in patterns of excessive gambling behaviour.

Another significant finding by the Productivity Commission and other Australian research is that problem gambling not only affects individual gamblers, it also impacts on families, other groups and the community as a whole. Rather than a problem of individual pathology or psychological disorder, the prevailing view in Australia is that problem gambling is a social and public health issue that occurs when gambling gives rise to harm to the individual gambler, his/her family and/or the community.[5] Evidence suggests that five to ten other people can be directly affected to varying

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[2] Productivity Commission 1999. *Australia's Gambling Industries*, Report No. 10, AusInfo, Canberra.

[3] *American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders* 1980; and *3rd ed.* 1987.

[4] Blaszczynski, A. and Nower, L. 2002. 'A pathways model of pathological and problem gambling'. *Addictions* 97(5), pp. 487-499.

[5] Productivity Commission, op. cit,, Chapter 7. Also Dickerson, M., J. McMillen, E. Hallebone, R. Volberg, R., and Woolley. 1997. *The Definition and Incidence of Problem Gambling*. Melbourne: Victorian Casino and Gaming Authority.

degrees by the behaviour of a problem gambler. In addition, there are demands on the resources of community and public services; communities as a whole can experience harm from problem gambling.

While emphasising the prime need to better understand and address the nature of problem gambling, the general opinion of the Productivity Commission was that there is scope for the development of more appropriate measures and methods to recognise problem gambling in the general population. At the time of the Productivity Commission's survey, various versions of the SOGS (South Oaks Gambling Screen) had been widely used in Australia, New Zealand, the USA and Canada to measure the prevalence of problem gambling. SOGS had originally been developed to measure problem gambling among people in clinical treatment programs but versions of the screen were commonly used in general population studies. However, criticisms within the Australian research and service communities regarding the use of SOGS as a research tool arose from a growing dissatisfaction with the ability of SOGS to accurately assess problem gambling as manifest in the general Australian community. The Productivity Commission also expressed reservations about the SOGS and DSM-IV instruments given the cultural diversity in Australia.[6]

In response to criticisms of the SOGS, the Victorian Casino and Gaming Authority (VCGA) in 2000 commissioned the development of a new screen, the Victorian Gambling Screen (VGS). It is the primary purpose of this study to conduct validation tests on the VGS with data from the *2003 Victorian Longitudinal Community Attitudes Survey.*

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[6]   ibid., p.6.42-6.43.

Background to Research

As background to the survey and validation study, in 2001 the GRP commissioned a scoping study to provide theoretical background for the evaluation of the VGS, review existing evidence and develop details for the survey design and the evaluation methodology (*Project 1a: Scoping Study of the Victorian Gambling Screen*).

However the report of that study was not available prior to the design and conduct of the statewide survey (March–May 2003), although researchers working on the scoping study were consulted during the design of the survey (February–March 2003). A draft scoping study report (July 2003) was subsequently provided by the GRP and was used to inform our evaluation of the VGS.[7] The final scoping study report, *Evaluation of the Victorian Gambling Screen,* was published after our validation research was completed.[8]

The draft scoping study report concluded that:

- The VGS has been developed in line with 'well-substantiated test development protocols' but 'further validation of the tool involving a large validation sample is required'[9];

- The VGS should be compared with existing established problem gambling screens 'in order to select the most suitable gambling measurement tool for subsequent community studies'[10]. A validation study involving the VGS with the Canadian Problem Gambling Screen (CPGI) and the South Oaks Gambling Screen (SOGS) was recommended;

- 'The study should compare the performance of each of these tools in a large-scale survey of the Victorian community'; and it should ensure that 'sufficient numbers of people at different levels of gambling activity are included as the study must show that the tools can work well across the full range of gambling participation'.[11]

The 2003 *Victorian Longitudinal Community Attitudes Survey* and this validation study have closely followed these objectives. Preliminary consultation with authors of the draft scoping study made significant contributions to the rationale and design of the survey.[12] Importantly, however, the present research diverges from one of its design suggestions.

The draft scoping study suggested 'a concurrent validation trial where all the tools are contemporaneously administered to the same sample of respondents' that would allow researchers to 'examine the statistical inter-relationships' between the three tools. However the 2003 survey administered each problem gambling tool (VGS, SOGS 5+, CPGI) to a separate randomly chosen sub-sample of respondents. Applying all three gambling screens to all respondents would have required exceedingly long interviews and, as the three screens have similar questions, a degree of repetition that many respondents would find unacceptable. If a higher rate of respondents refused to

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[7]   Thomas, S. and Jackson, A. 2003. *Project 1a. Scoping Study of the Victorian Gambling Screen*. Draft report prepared for the Gambling Research Panel, July 2003. Content and page numbers cited may differ from the final report by Melbourne Enterprise International (*Evaluation of the Victorian Gambling Screen)*.

[8]   Melbourne Enterprise International 2003. *Evaluation of the Victorian Gambling Screen.* Gambling Research Panel, Melbourne.

[9]   Thomas and Jackson. op.cit, p.7.

[10]   Thomas and Jackson. op.cit, p.7.

[11]   Thomas and Jackson. op.cit, p.7.

[12]   McMillen, J., Marshall, D., Ahmed, E. and Wenzel, M. 2003. *The 2003 Victorian Longitudinal Community Attitudes Survey.* Report prepared for the Gambling Research Panel.

participate, terminated the interview prematurely or given false responses, the validity of responses could have been undermined.

In terms of the validation study objectives, the procedure of applying each screen to a different random sub-sample of respondents meant that inter-relationships between the three problem gambling screens could not be investigated. Thus, one aspect of construct validity, where instruments presumably measuring the same concept are used to validate each other, could not be tested. Other means to test for construct validity were employed instead.

Rationale for the Validation Study

The Productivity Commission's 1999 inquiry had acknowledged that there is strong disagreement between researchers about the validity of the different problem gambling measures commonly in use.[13] The key issue appears to be whether problem gambling can be adequately assessed using a psychological framework with a clinical emphasis on behavioural responses or whether criteria that are more sensitive to cultural and environmental factors should also be included.

The SOGS had been the dominant problem gambling screen in Australia and many other countries, and had been used in numerous gambling studies, including the Productivity Commission's own national survey. SOGS thus offers the advantage of being an established instrument for which comparative figures exist. However, it has been criticised for several reasons, including its underlying clinical theoretical model of problem gambling.

As a response, the CPGI was developed in Canada and the VGS in Australia for application to general population surveys. Both claim to be built on a definition of problem gambling in terms of harm — harm to self, others and the wider community. In this regard, the Productivity Commission noted that the Canadian Problem Gambling Index (CPGI) was 'highly promising'. The VGS was developed by Flinders Technologies Pty Ltd for application in large population surveys but it had not previously been tested on a large population sample.

Drawing on preliminary consultations with the Gambling Research Panel, the 2003 statewide survey incorporated three problem gambling screens (VGS, SOGS5+ and CPGI) to allow cross-validation tests. For comparability, the research strategy maintained continuity with previous Victorian problem gambling prevalence studies, the Productivity Commission and ACT gambling surveys, all of which used the SOGS5+ score for problem gambling, while allowing comparative testing of the VGS screen and possible progression to a new screen, the CPGI. The CPGI screen had previously been utilised in a large statewide prevalence survey in Queensland (2001) and in many Canadian provinces.

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[13]   Productivity Commission 1999. *Australia's Gambling Industries*, Report No. 10, AusInfo, Canberra, pp. 6.40-6.41.

Problem Gambling Screens

Problem gambling is a significant societal problem and public health issue, and for this reason it is also of major interest to scientific research. In order to make informed, evidence-based public policy decisions, and to identify and study the problem, it is necessary to be able to measure problem gambling reliably, validly and efficiently. This is the general purpose of problem gambling screens. They are instruments that can be easily administered, even on a large scale, to measure the extent and degree of problem gambling.

Purposes

More precisely, as argued in the draft scoping study, various purposes of such measurement tools need to be differentiated.[14] For instance, problem gambling screens may be used for:

- Current diagnostic purposes (e.g. to estimate the extent of the problem in a community);

- Predictive diagnostic purposes (e.g. to identify who is at risk of developing a gambling problem); and

- Therapeutic diagnostic purposes (e.g. to decide what needs to be done to treat the problem).

The development and validation of such tools needs to reflect their major and primary purpose. For instance, for current diagnostic purposes, the instrument may focus on current or recent self-reported behaviour, while current or recent behaviour may not be the best predictor for future behaviour and thus not the best measure for predictive purposes. Likewise, to validate an instrument with regard to current diagnostic purposes, the validation criteria should be concurrent and refer to the same time period. In contrast, the predictive validity of an instrument needs to be assessed in longitudinal studies, where the validation criteria are obtained a certain time after administration of the screening tool.

For the present research, it is assumed that the primary purpose of a problem gambling screen to be developed for the Australian context is the assessment of the current extent and degree of problem gambling, which can be used to inform public policy and to help study the phenomenon. Consequently, this study uses methods of concurrent validation.

Period prevalence

As the primary purpose of the screens in this study is defined as the measurement of the rate, or prevalence, of problem gambling in the population, this raises the question of which time interval the measurement should refer to.[15] Prevalence of problem gambling means the relative number of people in the population who are problem gamblers within a certain period of time.

Some screens, such as the original version of the SOGS, do not specify a time interval but rather ask whether respondents have ever, in their life, shown certain behaviours or attitudes that may be indicative of problem gambling.[16] These screens measure so-called lifetime prevalence. However, this measure of prevalence could be too broad and unspecific to capture more short-term developments in the population and to inform responsive policy decisions.

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[14]   Thomas, S. and Jackson, A. 2003. op.cit,, p. 21.

[15]   ibid, p. 30ff.

[16]   Lesieur, H. and Blume, S. 1987. 'The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers'. *The American Journal of Psychiatry, 144*(9), pp. 1184–8.

As an alternative, problem gambling screens can specify more limited time intervals and determine whether respondents have shown indications of problem gambling, for instance, within the last six or twelve months. There are no strict principles that clearly determine which time interval would be most appropriate in a given situation, but it would appear to be 'dictated by the specific phenomenon whose prevalence is sought'.[17] As problem gambling usually develops over time, and various indicators such as problem behaviour and negative consequences may be separated from each other by an extended time, the time interval chosen should not be too short.

In the present research, all three screens referred to a 12-month period and thus measured 12-month prevalence of problem gambling. This is consistent with the procedure adopted in the more recent surveys in Australia, the Productivity Commission's *National Gambling Survey* (1999), the *Queensland Household Gambling Survey* (2001) and the *Survey of the Nature and Extent of Gambling and Problem Gambling in the ACT* (2001).[18]

Theory

Measurement tools, such as problem gambling screens, reflect implicit or explicit theories about the phenomenon in question. Different theories are likely to produce different tools and thus different empirical findings about the phenomenon. Ideally, the developers of such tools should explicate the theory of problem gambling that informed the construction of their tool. Regrettably, this is not always sufficiently the case.

A closer look at the content of different problem gambling screens can inform us about the theory that is implicit in the instrument or, at least, about different facets of the phenomenon represented in the measures. The draft scoping study suggested a conceptual model — attitudes, behaviour, consequences — and used this to compare the content of various problem gambling screens.[19] While these three categories are rather broad and abstract, further insights may be obtained from a comparison of more specific and substantial facets.

The present study conducted such a content analysis of the three different screens investigated here. This allows an assessment of the comparability of the different tools and their implicit understanding of problem gambling. For the evaluation of the VGS, it will allow an evaluation of the face validity of the specific measures used and whether certain facets of the phenomenon are over or underrepresented in the screen.

Continuum and classification

Theory may also determine whether problem gambling is understood as a dichotomous attribute or rather as a continuum. For instance, theoretical models that view problem gambling as an addiction or disorder are likely to regard it as dichotomous, as being either absent or present in a person.[20] In contrast, theories of problem gambling that regard it rather as a social problem are more likely to think of it as a continuum, where gambling can be more or less disruptive to one's social life and where social environments may vary in their reactions to gambling involvement.

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[17] Walker, M. and Dickerson, M. 1996. 'The prevalence of problem and pathological gambling: A critical analysis', *Journal of Gambling Studies*, 12, pp. 233-249.

[18] Queensland Policy Directorate 2001. *Queensland Household Gambling Survey*, Queensland Treasury. Australian Institute for Gambling Research 2001. *Survey of the Nature and Extent of Gambling and Problem Gambling in the ACT*. Report prepared for the ACT Gambling and Racing Commission, Canberra.

[19] Thomas, S. and Jackson, A. op. cit. pp. 8 and 41ff.

[20] See Shaffer, H. (2003) A critical view of pathological gambling and addiction, in: G. Reith (ed.), *Gambling: Who Wins? Who Loses?,* Amherst, NY: Prometheus Books, pp.175-190.

However, as argued in the draft scoping study, the measurement of problem on a continuum or in terms of categories is also a matter of the research purpose of the measurement instrument.[21] In this sense, if we understand problem gambling as a continuum as suggested by the Productivity Commission, the classification of respondents into problem versus non-problem gamblers is an effective means of simplifying communication about the phenomenon. The prevalence of problem gambling in a population could of course also be expressed as the population's mean score on a certain gambling screen. However, such a mean score is rather meaningless, unless we compare it with the mean scores of other reference populations or investigate mean scores over time. Then we could say, for instance, that one population has a greater gambling problem than another population; or that the gambling problem in the population has increased or decreased. However, for statements about the extent of a gambling problem in absolute terms, in one population at a given time, we need to categorise and define which scores represent 'problem gambling'.

Nonetheless, it needs to be emphasised that, while we may prefer to make such statements in absolute terms, there is no absolute measurement of problem gambling. The classification of continuous screen scores into discrete categories of problem versus non-problem gamblers is arbitrary and mere convention. This is not a problem peculiar to problem gambling screens: even diagnoses derived from the most careful in-depth interviews, or a person's self-diagnosis, are based on theoretical or implicit societal conventions. This does not mean, however, that the convention for cut-off scores cannot be informed by reason.

The draft scoping study discussed various reasonable approaches of determining cut-off points for such classifications.[22] However, three of these are excluded here:

- The relative frequency approach is based on a 'reasonable' percentage of abnormal cases and thus is based on a certain prevalence rate of problem gambling. However, in our case, the main purpose of the gambling screens is to provide an empirical estimate of the prevalence rate;

- The absolute value criterion assumes that there are objective correlates of a certain gambling screen score that determine which score is problematic and which one is not. Such objective correlates hardly exist in the debated area of problem gambling. Often the outcomes of an in-depth clinical interview are taken as a 'gold standard' (while they are in fact also subjective). Clinical follow-up interviews have not been available for the present report;

- The expert judgment approach relies on the consensus of experts in the field. Such a consultation of experts was not part of the present project. It is in fact doubtful whether consensus on the issue could be reached, at least without the empirical basis that the present study aims to provide.

As a variation on the absolute value criterion approach, it is also possible to use other correlates measured concurrently with the problem gambling screen and to identify cut-off scores that maximise the relationship between the problem gambling classification and the correlates. Of course, the correlates (e.g. suicidal tendencies due to gambling) are in this case only measured by self-report and burdened with measurement problems themselves, and so they do not constitute an objective 'gold standard'.

A fourth approach suggested in the draft scoping study will also be investigated here, namely the frequency distribution shape approach. This approach is based on the possibility that the distribution of screen scores is bimodal (or multimodal), suggesting that there are distinct sub-groups in the

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21   Thomas, S. and Jackson, A. op. cit. p.22.
22   ibid, p.22.

population. However, there are no clear criteria that determine where exactly to draw the boundary between two distributional peaks.

Response scales

Independent from the question of whether the underlying phenomenon of problem gambling should be conceived as dichotomous or continuous (or if it is dichotomised for ease of communication), another question is whether the individual indicators of the phenomenon should be measured in dichotomous versus graded formats.

For instance, most items in the original SOGS were responded to in a yes/no format. That is, respondents were asked to answer questions such as 'Have you gambled more than you intended to?' with either yes or no. In contrast, more recent adoptions of the SOGS in the Australian context used a more graded response scale, where respondents could indicate whether a certain item applied to them 'never', 'rarely', 'sometimes', 'often' or 'always'.[23] It could be argued that the graded response format provides more information. For the 'Have you gambled more than you intended to?' question, for instance, it should make a difference to the degree of the gambling problem whether, yes, the respondent did gamble more than he or she intended to, but only once in the whole time period; or whether it indeed applied to numerous occasions of his or her gambling involvement.

Most current problem gambling screens in fact used some form of graded response scale. This was also the approach taken in the present study. The VGS has indeed been developed with exactly the five-point scale described above. The CPGI originally used a four-point scale, while the SOGS had, as mentioned, mostly dichotomous response formats. In the 2003 Victorian survey both scales were also used with the five-point response format. This allowed for an evaluation of the three screens independent from original differences in their response formats. A comparison between the screens should thus determine which screen had superior measurement qualities purely in terms of the indicators and item formulation used. Our analyses should also demonstrate whether the qualities of the two established screens, CPGI and SOGS, depended on the specific coding of survey responses.

However, because the cut-off scores that were established to define different gambling categories for the latter two screens are based on their specific response formats, the original coding of the items had to be maintained for estimates of prevalence rates. Therefore, for the CPGI the five-point scale was recoded into the original four-point format. Following the *Queensland Household Gambling Survey*, the response categories 'rarely' and 'sometimes' were combined and given the same score (1, which was labelled in the original version as 'sometimes'). For the SOGS, a hierarchical measurement approach was applied, consistent with the Productivity Commission's national survey. Respondents were first given the response options 'yes' or 'no' and, in a second step, were asked to qualify their 'no' response to either a 'never' or 'rarely', or their 'yes' response to a 'rarely', 'sometimes', 'often' or 'always'. These qualified responses were then used to achieve the five-point coding.[24]

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[23]   Dickerson, M., Baron, E., Hong, S.-M. and Cottrell, D. 1996. 'Estimating the extent and degree of gambling related problems in the Australian population: A national survey'. *Journal of Gambling Studies*, 12, pp. 161-178.

[24]   See Lattimore, R., and Phillips, R. 2000. 'The impacts of legal gambling and the prevalence of problem gambling in Australia'. Paper presented at the 11th International Conference on Gambling and Risk Taking, MGM Grand Casino, Las Vegas, June 12-16, 2000.

Three Problem Gambling Screens

The present research used and tested three different problem gambling screens. First of all, the main purpose of this research was to validate a new instrument developed for the Australian context: the Victorian Gambling Screen (VGS). Commissioned by the Victorian Casino and Gaming Authority, this instrument was developed by Ben-Tovim *et al.* in association with Flinders Technologies. The evaluation of this instrument required a comparison with other established tools. The present study thus also used the South Oaks Gambling Screen (SOGS), which was originally designed by Lesieur and Blume and is the most widely used problem gambling screen. However, more recently it has become subject to increasing criticism and, not least as a consequence of this, other screens have been developed, including the Canadian Problem Gambling Index (CPGI) developed by Ferris and Wynne.

The South Oaks Gambling Screen

The SOGS is the most widely used problem gambling screen; it has been extensively used, reviewed and criticised. Its performance in and of itself is not of prime concern in the present research. Rather, because it has been the standard instrument in gambling research, it will serve here primarily as a comparative reference for the two more recent tools. The SOGS has been described and discussed in more detail elsewhere.[25]

The development of the SOGS was based on the diagnostic criteria of pathological gambling as used in the DSM-III and DSM-III-R.[26] It is thus built on a clinical model; it has been designed to identify 'pathological' gamblers in clinical populations and has usually been validated with reference to interviews based on clinical DSM criteria.[27] Much of the criticism of the SOGS centres on this clinical basis, arguing that it is questionable whether it is an appropriate tool to measure the prevalence of gambling problems in population studies. Also, the concept of pathological gambling underlying the instrument has not been clearly specified, and some of the items used may not specifically apply to pathological gamblers. Furthermore, the SOGS contains a disproportionate number of items on the issue of whether respondents borrowed money from various sources for their gambling activities.[28]

Nonetheless, in the past the SOGS has been the main instrument to measure problem or pathological gambling, and as such any new instrument should be compared to it as a benchmark. The SOGS is a 20-item questionnaire, with items tapping into various dimensions of problem gambling that will be clarified in our own content analysis. The instrument in its original format used a yes/no response format for most questions, and even those items (1 and 2) that used a different format were dichotomised. The SOGS score is obtained by summing up the yes responses and can thus range from 0 to 20. A cut-off score of 5+ has been identified as indicating 'probable pathological gambling' and in Australia this score has become convention to define problem gamblers. Scores from 3 to 5 are supposed to indicate 'possible pathological gambling' and respondents with scores of 10+ are sometimes referred to as 'severe problem gamblers'.

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[25]   e.g. Battersby, M., Thomas, L., Tolchard, B. and A. Esterman 2002. 'The South Oaks Gambling Screen: A review with reference to Australian use', *Journal of Gambling Studies*, 18, pp. 257-271; Orford, J., Sproston, K., and Erens, B. 2003. 'SOGS and DSM IV in the British gambling prevalence survey: Reliability and factor structure', *International Gambling Studies*, 3 (1), pp. 53-65.

[26]   *American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders* 1980; and *3rd ed.* 1987.

[27]   Abbott, M. and Volberg, R. 1996. 'The New Zealand national survey of problem and pathological gambling', *Journal of Gambling Studies*, 12, 143-160; Lesieur and Blume 1987), op. cit.

[28]   See Battersby *et al.* op.cit.

The Canadian Problem Gambling Index

The CPGI has been developed partly as a response to the potential shortcomings of the SOGS. The developers intended to design an instrument that is more appropriate for prevalence surveys of the general population, including groups that are typically underrepresented in clinical samples and that are less typical problem gamblers. It aimed to address to a greater degree the social and environmental contexts of problem gambling and to include the measurement of correlates of problem gambling that permit a better understanding of the profiles of groups of problem gamblers.[29]

In fact, the CPGI in its complete form is a rather long instrument that includes four different sections, namely:

- A detailed measurement of respondents' involvement in various forms of gambling;

- The assessment of problem gambling;

- An evaluation of correlates of problem gambling (e.g. family history, alcohol or drug use); and

- Demographic variables.

For the present research, only the second section on the assessment of problem gambling is relevant and was thus included in the survey. This section contained twelve items in total, but only nine of them are included in the problem gambling score (in Canadian studies this nine-item score is referred to as the Problem Gambling Score Index — PGSI). Five items address issues of gambling behaviour, such as having to gamble with larger amounts for the same level of excitement, chasing losses, feeling like having a gambling problem; and four items address consequences such as health or financial problems and feelings of guilt. Our content analysis will give further details on the various facets represented in the CPGI.

The items were originally used with a four-point response scale (0 = never, 1 = sometimes, 2 = most of the time, 3 = always). Scale scores were obtained by summing up the responses across the nine items. Thus, scores could range from 0 to 27 and are interpreted as follows:

- 0 = non-problem gambling;

- 1–2 = low risk;

- 3–7 = moderate risk;

- 8+ = problem gambling.

Ferris and Wynne investigated the measurement qualities of the CPGI on the basis of a sample of 3,000 adult Canadians. A random sub-sample was re-interviewed in order to assess the re-test reliability of the screen. Further, samples of respondents whose SOGS and DSM scores fell into different categories of problem gambling were also interviewed by clinicians to provide another criterion for the evaluation of validity.

Item analysis and selection yielded the nine scoreable items, which proved to represent a single factor and showed a relatively high internal consistency (0.84, which was higher than for the DSM-IV and SOGS). Re-test reliability was also satisfactory (0.78), but lower than for the DSM-IV. Three different item-weighting procedures were trialled, but the simple weighting proved no less satisfactory than more complex weightings. CPGI scores were highly correlated with DSM and SOGS scores (0.83), and moderately correlated with the clinical interviews (0.48). Ferris and Wynne point out that

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[29]   Ferris, J. and Wynne, H. 2001a. *The Canadian Problem Gambling Index: Final Report*. Submitted to Canadian Centre on Substance Abuse*;* Ferris, J. and Wynne, H. 2001b. *The Canadian Problem Gambling Index: User Manual.* Report to the Canadian Inter-Provincial Task Force on Problem Gambling.

the clinical interview cannot be considered as a more valid or objective standard ('gold standard'), as the reliability of the clinical interviews is at least equally problematic as for the standardised screens.

The cut-off points detailed above were determined through maximising the classification accuracy with reference to DSM, SOGS and interview categorisations of problem and non-problem gamblers. With these cut-off points the CPGI yielded a good level of classification sensitivity. For instance, 83 per cent of respondents classified as problem gamblers according to DSM were classified equally (62 per cent for SOGS and 78 per cent for interviews). The CPGI yielded 100 per cent classification specificity; that is, all respondents classified as non-problem gamblers according to the other two screens and the interview were classified as such. Finally, the CPGI classifications displayed a good level of construct validity and showed expected relationships with correlates of problem gambling.

This first validation of the CPGI thus yielded positive results. However, it should be kept in mind that the development (item selection) and validation of the instrument were both based on the same sample. Also, the validation of the CPGI was to a large degree based on DSM and SOGS as reference standards, even though their underlying model of pathological gambling was rejected. Further evidence for the measurement qualities of the CPGI has been provided in several surveys in Canadian provinces.[30] The CPGI has also been incorporated into the Statistics Canada Mental Health and Wellbeing dataset (25,000 cases). However, the CPGI has so far only been used once in the Australian context, namely in the 2001 *Queensland Household Gambling Survey*; and this study did not evaluate explicitly the qualities of the instrument, even though it appeared to be a useful and appropriate tool.[31]

The Victorian Gambling Screen

For similar reasons, as was the case in the Canadian screen, the Victorian Casino and Gambling Authority commissioned the development of a new problem gambling screen that would:

- Depart from models of pathological gambling and rather be based on a definition of problem gambling in terms of harmful consequences (similar to the CPGI); and

- Be more appropriate for the Australian context where, for instance, gambling is relatively widespread and accepted.

To inform such a specific understanding and attitude to gambling in Australia, the development of the VGS was, as a first step, based on a number of focus groups held in Victoria, including focus groups with self-declared regular and heavy gamblers. These focus groups, together with a review of the literature, yielded a large number of items relevant to problem gambling that were reduced through item analysis. Factor analysis of the remaining items yielded three factors:

- Harm to self;

- Harm to partner; and

- Enjoyment of gambling.

To further refine the instrument and conduct a preliminary validation, a pilot study was conducted with 239 gambling respondents. First, confirmatory factor analysis was applied in order to test and cross-validate with a different sample the three-factor structure. The analysis replicated the three-factor solution, and after excluding some further questions, the model showed a good fit to the data. The instrument included 21 items,

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30   See for example, Smith, G.J. & Wynne, H.J. 2002. *Measuring gambling and problem gambling in Alberta using the Canadian Problem Gambling Index*. Report prepared for the Alberta Gaming Research Institute.

31   Brodie, M., 2003. Queensland Policy Directorate, personal communication.

with fifteen items indicating harm to self, three items measuring harm to partner and three indicators of enjoyment of gambling. The more specific facets included in the instrument will be discussed in the content analysis.

For the validation of the instrument, the VGS researchers rejected the idea of only using the SOGS and DSM as validation criteria as these were based on a different model of problem gambling. Instead, they decided to develop an open-ended interview instrument, administered by lay interviewers, and to have assessors judge the taped interviews with regard to the level of problem gambling that they betrayed. For the scoring of the interview, the researcher provided assessors with a list of criteria to guide the distinction between problem and borderline problem gamblers. In addition, interviewers also used the DSM criteria for the assessment of problem gambling status.

A sub-sample of the pilot study was interviewed ($n = 71$). Logistical regression analyses showed that only the 'harm to self' scale was significantly related to the classification as problem gamblers versus non-problem gamblers. Thus, only the 'harm to self' scale was therefore relevant for the development of the problem gambling screen. All items of this scale were measured on a five-point scale (0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = always). Scores were obtained by summing up item responses and thus could range from 0 to 60.

For the 'harm to self' scale, which also showed a very high internal consistency, cut-off scores were then determined based on a technique called Receiver Operating Characteristic (ROC). This technique plots for a problem gambling score (i.e. any continuous variable) the level of error of falsely identifying somebody as having a gambling problem and the level of error of falsely identifying somebody as not having a gambling problem. A cut-off score is then chosen that optimises the balance between both these errors. For the interview outcome as validation criterion, the procedure yielded a cut-off score of 21+ for the classification as problem gambler, and a cut-off score of 9+ for the classification as borderline problem gambler.

Note, however, that when the DSM classification as pathological gamblers was used as criterion variable, the ROC procedure yielded a much lower score of 15 as the optimum cut-off.

On the one hand, this may indicate that the interviews and the DSM criteria themselves did not produce consistent classifications in terms of what they define as problem and pathological gamblers, respectively. On the other hand, this means that the cut-off scores that the pilot study established for the VGS needs be viewed as preliminary and as requiring further validation.

First, for instance, it is of interest whether these cut-off scores yield population prevalence estimates that are reasonable and consistent with other prevalence studies.

Second, it may be considered a limitation of the study that the interviews were conducted on the basis of a specifically designed format, and also scored according to specifically developed criteria, that could reflect the VGS, if not the authors' own, more particular understanding of problem gambling. Not surprisingly, the pilot study might indicate that the screen and the interviews measured a very similar thing. However, for a further validation, we would need to know how VGS scores relate to other, more truly external criteria. For instance, the study did not report any relationships to known correlates of problem gambling.

Finally, the pilot study involved only a relatively small sample of 71 cases, and the authors therefore called for further validation work based on larger samples.[32] The present research addresses all three issues.

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[32]   Ben-Tovim *et al.,* op.cit.

Methodology

The main research activities for this validation study involved a literature review, a large sampled telephone survey with complementary questions to enhance collection of data pertinent to the project objectives, and statistical analysis of survey data. These methods were supplemented by consultation with the Gambling Research Panel (GRP), relevant stakeholders in Victoria as well as technical experts in other states and overseas.

A literature review of relevant Victorian, overseas and Australian research on problem gambling screens and their application, as well as analysis of survey data, informed the design of the validation study and the issues addressed in this report.

For the present purpose, the methodology was to ensure a representative sample of the Victorian adult population to provide a broad empirical basis for the validation of the screens and for valid estimates of problem gambling prevalence rates the:

- Instrument needed to include sufficient information about gambling involvement and correlates that could be used to validate the problem gambling screens — as was of course the case for this extensive survey;

- Sample needed to be large enough to provide a sufficient number of regular gamblers who would then be subjected to one of three gambling screens; and

- Approach needed to maintain, as much as possible, the representativeness of the sample for the wider population (including minority groups), for instance through random sampling, minimisation of drop-outs and non-response and the use of multilingual interviewers.

This section focuses on methodological issues relevant to the present report. Further details about the general survey methodology are included in the *Victorian Longitudinal Community Attitudes Survey Report*.[33] To appreciate the methodological details and complexities, it needs to be remembered that the survey served a dual purpose as a population survey and validation study.

Statewide survey

The statewide survey was conducted by ACNielsen in April and May 2003. Households were randomly selected from residential telephone numbers in the Electronic White Pages (EWP) for the State of Victoria. A significantly larger sample than in previous Victorian surveys was required with the purpose of achieving an adequate sample of people with gambling problems for cross-validation analysis of the three screening instruments. Based on responses for the 1999 national survey and the 2001 ACT survey, the study aimed to undertake interviews with a minimum of 150 problem gamblers, assuming a prevalence rate at between 1 per cent and 2 per cent.

The process of randomisation ensured that a proportionate sample of respondents from ethnic, ATSI and cultural groups was initially sampled. Moreover, multilingual interviewers employed at the initial point of contact facilitated inclusion of these groups who do not possess the language skills to participate in English. ACNielsen also ensured that respondents with a hearing impairment were not disadvantaged in terms of participation. A selected sample approach was used rather than a strict random sample approach, adopting a method used in the 2001 ACT gambling survey (Figure 1).

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[33]   McMillen, J. *et al.* 2003. op. cit.

Figure 1:   Selected sample process

Total Effective Sample
n = 8,479

Screening for involvement in gambling

Non-gamblers
(n = 2,127)

Non-regular gamblers
(n = 5,846)

*Regular gamblers
(n = 506)

Random selection for general interview

one-in-three non-gamblers
(n = 689)

one-in-six non-regular gamblers
(n = 855)

All regular gamblers
(n = 506)

Willing to continue core interview (n = 1,758)

Non-gamblers
(n = 608)

Non-regular gamblers
(n = 717)

Regular gamblers
(n = 433)

Lotteries/
scratchies
only
(n = 260)

Other than
lotteries/
scratchies
(n = 457)

Problem-gambling screens:
VGS   CPGI   SOGS
(n = 149)   (n = 141)   (n = 143)

Core interview (regular gambling participation etc.)
(n = 890)

Demographics and conclusion of the survey
(n = 1,758)

Note: In this Figure, n = unweighted figures. Except where indicated, all figures presented in Tables and Figures below are weighted.

* Regular gamblers are defined as those who participated at least weekly (i.e. 52 times per year) in gambling activities *other than* lottery games or scratch tickets.

An initial screening process was first used to determine respondents' gambling status. Then, only a random selection of those qualifying for the two most populous groups (1 in 3 non-gamblers and 1 in 6 non-regular gamblers) were interviewed further. All respondents who were identified as regular gamblers were interviewed. This method meant that regular gamblers were over-sampled, providing reasonable numbers for analysis purposes, while selecting only a proportion of non-gamblers and non-regular gamblers meant costs were contained. For the present study, only the data of regular gamblers are relevant.

Respondents

A total of 8,479 adults (over 18 years) living in Victoria and residing in households with a telephone were interviewed. In households with more than one adult, the person whose birthday was closest to the interview date was selected for participation. This method required an adjustment in the weighting of the data (see 'Data weighting' on page 32).

The initial screener determined the respondents' involvement in gambling activities. Following the ACT study, respondents were classified as 'regular gamblers' if they had participated at least weekly (i.e. 52 times) in any gambling activities other than lottery games or instant scratch tickets in the previous 12 months. In total, 506 cases, or 6.0 per cent of respondents, met this criterion and were considered as regular gamblers and completed the full interview. This was a lower rate than the prediction underlying the design of the survey and meant that the sample sizes were less than ideal for this study.[34]

All regular gamblers were then subjected randomly to one of the three problem gambling screens and asked to continue with the interview. However, 73 regular gamblers declined further participation, leaving 433 cases. The VGS was applied to one group ($n = 149$), the CPGI to another group ($n = 141$), and the SOGS to the remaining group ($n = 143$). Each regular gambler was only tested by one problem gambling screen.

After the problem gambling screens, the survey continued with the 'core interview' that contained questions about gambling-related experiences, including correlates of problem gambling used here for validation purposes. All regular gamblers completed this section (together with a random sub-sample of non-regular gamblers).

The administration of screens to regular gamblers only was based on the assumption that problem gamblers were unlikely to be found among non-regular gamblers (and obviously not among non-gamblers). Because the screens' main purpose was to assess the prevalence of problem gambling, such a focus on regular gamblers made sense. It was more economical and meant that non-regular gamblers did not have to answer many questions that were irrelevant to them. This procedure is consistent with the Productivity Commission's national survey as well as the ACT survey.

However, this procedural choice also meant that the present study could only estimate prevalence rates of problem gambling, but not the prevalence of groups with lower levels of risk. This is because low or moderate-risk gambling (as they are claimed to be distinguished by the CPGI, for instance) are not necessarily only found among regular gamblers. Thus, an estimation of their prevalence in the general population is not possible on the basis of the present screening of regular gamblers only.

Likewise, the procedure of subjecting three randomly chosen sub-groups of regular gamblers to only one of the three screens was also more economical and more acceptable to survey participants than testing each respondent by all three screens. It relieved participants from having to answer a number of similar questions contained in the different screens, ensuring that people would not abort the survey because they were annoyed about repetition. Furthermore, the procedure meant that each screen was evaluated under conditions which would most likely be applied in future studies, namely as a stand-alone screen uninfluenced by questions provided by other screens.

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[34]   For possible explanations see McMillen, J. *et al*. 2003. op. cit

However, the procedure also meant that correlations between the different screens could not be calculated. Thus, in validation tests of the screens, we could not draw on the relationships between the screens to determine their construct validity (see below). Moreover, as with all similar surveys, the telephone methodology and self-report format of the survey are likely to have resulted in under-estimates of problem gambling prevalence.[35]

Response formats

As discussed in the earlier section on 'Problem Gambling Screens', the three problem gambling screens were originally developed and have been used with different response categories:

- VGS with 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = always;

- CPGI with 0 = never, 1 = sometimes, 2 = most of the time, 3 = almost always; and

- SOGS with 0 = no, 1 = yes (for most questions).

Even so, in its only application in Australia (*Queensland Household Gambling Survey 2001*), the CPGI was applied with a response format identical to the one used for the VGS (whose five-point response format is fairly standard for these kinds of rating scales). To be able to use the cut-off point defining problem gambling that had been established for the CPGI on the basis of its four-point response scale, response scores needed to be transformed from the five-point to the original four-point format. Specifically, scores were transformed to the original four-point scale by conflating response categories 'rarely' and 'sometimes' and giving each of them a score of 1. The same procedure was followed in the present Victorian survey.

Likewise, Australian researchers have tended to apply SOGS with a more graded five-point scale identical to the VGS response format, often in addition to the more customary binary (yes/no) response format.[36] This has been done using a hierarchical procedure, where an initial binary response (no/yes) was followed up with a more graded rating that allowed participants to qualify their binary response. For instance, when respondents answered yes to a question, they were then asked to specify to what degree this was the case. The same procedure was followed in the present Victorian survey.

This procedure allowed two strategies for the evaluation of the screening instruments. First, the screens can be used each with their standard coding and the findings can be compared with previous studies. The cut-off points that have been established for each of the instruments can be applied, and the prevalence rates of problem gambling can be compared with earlier research.

Second, the screens can be coded in a uniform way, using the rating scale from 0 to 4 for each screen. The psychometric qualities of the screens can thus be tested and compared with each other without the confounding influence of varying response formats. Using the same response format, any differences in reliability or validity between the screens can be attributed to the quality of their items (and the appropriateness of the underlying model).

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[35]   Lattimore, R., and Phillips, R., 2000, op. cit. See also McMillen, J. *et al*, 2003, op. cit.

[36]   Productivity Commission, 1999, op. cit.

Procedural issues

The survey was conducted using Computer Assisted Telephone Interviewing (CATI), which achieved a closely monitored and controlled survey process that resulted in high quality data. CATI offers the following benefits:

- Rotation of survey responses to remove any ordering effect;

- Automated sequencing, so that questions are asked in their correct order;

- Range and logic checks built into the program to ensure data validity;

- Ongoing validation: ten percent of all interviews are monitored by the supervisor listening in to the interview on-line as it is being conducted, to ensure quality standards are being maintained.

- Programmed callback times that are consistently honoured to encourage respondent co-operation; and

- Continual monitoring of all aspects of fieldwork due to detailed daily CATI reports.

The overall result is a very closely monitored and controlled survey process resulting in high-quality data.

It was not considered necessary to over-sample for different ethnic or cultural groups within the Victorian population due to the high proportion of varying ethnic groups within the population. The process of randomisation ensured that a proportionate sample of these respondents were initially sampled, however crucial to their inclusion were the strategies employed by ACNielsen at the initial point of contact to ensure that they participated in the process. ACNielsen's strategy for dealing with various ethnic groupings and to ensure they were not under-represented was to facilitate their inclusion when they do not possess the language skills to participate in English; thus multilingual interviewers were used.

Further, for a survey sample to be maximally representative, it needs to be ensured that contact is established with a high rate of the sampled prospective respondents, and that the contact leads to a high rate of participation. The following procedures were used to achieve as high a contact rate as possible:

- Generally calling in the evening or at weekends when individuals are more likely to be at home;

- Allowing the phone to ring at least 10 times before hanging up;

- Making up to four callbacks (that is, five contact attempts) to achieve an initial contact;

- Allowing a further five callbacks to achieve an interview, once contact was made and a respondent identified;

- Varying the time of day and day of week for callbacks, to increase the chance of catching gamblers who might be out during the evening; and

- Allowing fieldwork phase of sufficient duration (at least four weeks) to ensure that the proportion of numbers dialled that did not have their full number of callbacks completed was minimal.

ACNielsen also followed established protocols to maximise the participation rate once a respondent is contacted, including:

- Wording the survey introduction to encourage participation by stressing;

- The importance of the survey;

- The importance of the respondent's participation in the survey;

- The confidentiality of the information provided by the participants;

- Making a special effort to schedule callbacks at the convenience of the respondent;

- Having foreign language interviewing capability; and

- Having specially prepared responses for interviews in case a respondent indicated any reservation about participating.

Data weighting

Generally, weighting of data aims to increase the representativeness of findings for the target population. In this study, the target population are all adults (18+ years old) living in Victoria.

Relevant to the present report and its focus on regular gamblers, two factors had to be considered that might reduce representativeness. A weighting procedure is meant to correct for these as much as possible:

1. First, there is the problem of potential sampling errors and self-selection biases, for instance due to imperfections of the sampling frame or non-response to the survey. As a consequence, the sample may differ from the target population on socio-demographic characteristics and other variables. The weighting procedure here used Census information on the distribution of three such characteristics in the target population in order to create a sample that better represents the population at least on these selected variables; namely, gender, age and metro/non-metropolitan location.

    Specifically, for each combination of gender, age category and location, a weight was obtained by dividing the relative number of people in the population that fall into one such gender/age/location cell by the relative number of respondents in the present sample that fell into the same cell:

    Weight1$_i$ = (size of population cell$_i$ / population size) / (size of sample cell$_i$ / sample size)
    Note: i is the respondent; cell$_i$ is thus the gender/age/location cell in that the respondents belongs, and weight1$_i$ is the weight given to respondent i's data.

2. Second, the survey procedure determined that only one adult per household was to be interviewed (that adult was determined by the birthday method). This implies that, for each household contacted, people living in a larger household had a lower probability of being selected for the interview than people living in smaller households. An adult living in a single-person household was selected with a probability of 100 per cent, whereas a person living in a two-adult household had only a 50 per cent chance of being selected, and so on. The weighting procedure here corrects for this bias by weighting cases by the relative size of their household.

    Weight2$_i$ = size of household/average household size in the sample
    Note: i is the respondent; household$_i$ is thus the number of adults in the household in that respondent i lives, and weight2$_i$ is the weight given to respondent i's data.

    These two weights were combined by multiplication:

    $$\text{Weight1·2}_i = \text{weight1}_i \cdot \text{weight2}_i$$

Note that this weighting procedure maintained the sample size of 8,479 for the total sample. However, for the present report and its focus on regular gamblers the nominal sample sizes changed slightly. The nominal sample size for regular gamblers was now 525 (6.2 per cent of all respondents), of which a nominal 449 cases agreed to complete one of the three problem gambling screens; VGS ($n = 157$), CPGI ($n = 141$) and SOGS ($n = 151$). Whenever validation results detail absolute numbers, these refer to the nominal weighted n.

Social characteristics of problem gamblers

The complete results and analysis of the survey are provided in the report *The 2003 Victorian Longitudinal Community Attitudes Survey.*[37] For this validation study, however, the characteristics of problem gamblers are most relevant. Across all three gambling screens we found that:

- Around 15 per cent of surveyed regular gamblers in Victoria seemed to have had a gambling problem in the past twelve months; and

- Another 15 per cent of regular gamblers were borderline cases with a moderate risk of having (or possibly developing) a gambling problem.

The social profile of Victorian regular gamblers surveyed in 2003 is broadly representative of the population overall, although problem gamblers are more likely to be male:

- Across the three screens, 61.2 per cent of problem gamblers were male, which is significantly more than the proportion of males in the general Victorian population (48.5 per cent). However, while males were more strongly represented among problem gamblers, this is because they were already more strongly represented among regular gamblers (64.9 per cent);

- Among male regular gamblers, 14.2 per cent had a gambling problem in the past year, which is about the same as the ratio of problem gamblers among female regular gamblers (16.7 per cent);

- Generally, problem gamblers were disproportionately found among the age groups 50–64 (36.8 per cent) and 35–49 (33.8 per cent), compared to their shares in the general population (28.8 per cent and 24.6 per cent, respectively);

- Regular gamblers of non-English speaking background (24 per cent have a gambling problem), or who are separated or divorced (16.2 per cent) or who are on social security benefits (12.1 per cent) are also at risk;

- Problem gamblers were also more likely to have relatively low levels of education (less than tertiary degrees);

- Most problem gamblers across the gambling modes were working full-time, while a higher proportion of people who were unemployed (and to some degree those with home duties) had gambling problems than other gamblers with a different employment status;

- Thirteen per cent of the surveyed problem gamblers in Victoria live alone. Problem gambling was also more frequent among Victorians living in metropolitan areas than among those living in rural areas;

- Problem gambling appears to be related to other problems such as a family history of gambling (36.8 per cent of problem gamblers report a family history of problem gambling), alcohol and drug consumption while gambling (43.6 per cent), serious feelings of depression (59.0 per cent) and suicidal tendencies (11.1 per cent);

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[37]   McMillen, J. *et al.* 2003. op. cit.

- Regular (on average weekly) gambling on EGMs, racing and casino table games is a significant indicator of an increased likelihood of problem gambling. Playing EGMs/pokies was the favourite type of gambling for 84.2 per cent of problem gamblers identified by the three screens;

- 13 per cent of Victorian problem gamblers prefer casino gambling, significantly lower than EGMs and below the average for gambling overall;

- Betting on horse or greyhound races or a sporting event was the third favourite type of gambling among problem gamblers (8.8 per cent).

However, problem gamblers in Victoria differ in terms of other variables. For example:

- Those who play pokies/gaming machines were most likely from two-parent households, whereas those who prefer either race betting or Crown Casino games were most likely from a 'couple with no children' household;

- In contrast to the problem gamblers who play pokies and/or betting, the Crown Casino gamblers were younger and were born overseas.

Moderate risk gamblers

- Overall, an estimated 15.2 per cent of regular gamblers in Victoria are at moderate risk of gambling problems;

- Although moderate-risk gamblers are predominantly male (59.7 per cent), female regular gamblers are slightly over-represented;

- Moderate risk gamblers are also disproportionately, aged 18–24 (20.9 per cent), separated or divorced (11.8 per cent), or in two-parent families (44.3 per cent);

- Compared to other regular gamblers more moderate-risk gamblers (16.4 per cent) elect table games in casino as their favourite gambling activity;

- 22.1 per cent of moderate risk gamblers report a history of gambling problems in their immediate family; 16.2 per cent say they have the urge to gamble when something painful happens in their life; and 52.9 per cent report that they gamble under the influence of alcohol or drugs. The latter figure is not only higher than for low-risk regular gamblers but also higher than for problem gamblers (44.1 per cent).

Low-risk gamblers

- Low-risk gamblers tend to be male (66.8 per cent), 50+ years old (50.1 per cent), married (60.3 per cent), live on a salary/wage (58.6 per cent) or superannuation (25.2 per cent) as their main income source, live in group households (21.7 per cent), as a couple with no children (35.8 per cent) or two-parent families (26.4 per cent);

- The largest proportion of low-risk gamblers (46.1 per cent) prefer race betting to other forms of gambling.

Validation Results

Content analysis and face validity

Tables 1, 2 and 3 show the items for the VGS, CPGI and SOGS, respectively. The items of the VGS are supposed to cover three underlying dimensions of problem gambling, namely 'enjoyment of gambling' (Items 1 to 3), 'harm to partner' (Items 16 to 18) and 'harm to self' (Items 4 to 15 and 19 to 21). The latter items make up the majority of the instrument, and in a preliminary evaluation of the VGS it was this sub-scale that was the only one to discriminate between problem and non-problem gambling.[38] So, the focus of this validation analysis will also be on the 'harm to self' scale.

The CPGI is a larger instrument that includes questions about involvement in specific gambling activities, correlates of gambling and demographics. The relevant items for our purpose are provided in Section 2 on problem gambling assessment. The 12 items of that section are listed in Table 2. However, earlier research suggested that the first nine of the items had good qualities, with high consistency and representing one common factor, so that in effect they have become the CPGI problem gambling screen, or Problem Gambling Score Index (PGSI).[39] The nine items refer to various facets of problem gambling, such as loss of control, motivation, chasing, borrowing, lying and problem recognition.[40]

As previously discussed, the SOGS was designed by Lesieur and Blume (1987) on the basis of the Diagnostic and Statistical Manual (DSM) and its diagnostic criteria for pathological gambling. It has become the most widely used problem gambling screen. The 20 questions cover aspects such as chasing, problem recognition and deception, but a large part of the screen refers to borrowing money from various sources. The issue of borrowing seems over-represented in the instrument. The danger is that borrowing becomes a sub-dimension of problem gambling, undermining the uni-dimensionality and coherence of the instrument. Moreover, the different borrowing items may be unrelated to each other or even mutually exclusive. The fact that somebody borrows money from the bank does not mean they also borrow from relatives (indeed they may not need to borrow anymore).

Before investigating the empirical findings of the present study, it will be attempted to content-analyse and compare the different facets of problem gambling represented in the instruments. Because of the parallel administration of the three screens to different sub-samples of survey respondents, statistical interrelationships between the screens cannot be computed. A qualitative analysis of the represented facets may partly compensate for this and characterise the elements of the VGS in relation to the other two screens.

Table 1:   The Victorian Gambling Screen (VGS): Items and frequencies (in %)

No.	Item	Never	Rarely	Sometimes	Often	Always	Don't know/ refused
	Thinking about your gambling for the past twelve months…						
1	Has gambling been a good hobby for you?	13.9	11.5	40.0	18.6	16.1	
2	Nowadays, when you gamble, is it fun?	7.6	7.5	28.2	23.6	33.2	
3	Have you gambled with skill?	44.7	6.6	23.7	13.0	12.0	
4	Nowadays, when you gamble, do you feel as if you are on a slippery slope and can't get back up again?	70.7	3.8	13.4	4.5	6.9	0.6

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[38]   Ben-Tovim *et al.* op. cit

[39]   Ferris and Wynne op. cit.

[40]   Gambling Policy Directorate 2001. *Queensland Household Gambling Survey,* Queensland Government Treasury, Brisbane.

No.	Item	Never	Rarely	Sometimes	Often	Always	Don't know/ refused
5	Has your need to gamble been too strong to control?	82.0	5.5	6.1	4.0	2.1	0.3
6	Has gambling been more important than anything else you might do?	87.9	4.9	2.9	3.1	1.2	
7	Have you felt that after losing you must return as soon as possible to win back any losses?	77.5	3.5	11.1	2.5	5.4	
8	Has the thought of gambling been constantly on your mind?	71.6	7.9	12.9	3.5	4.2	
9	Have you lied to yourself about your gambling?	79.3	4.1	9.1	3.8	3.6	
10	Have you gambled in order to escape from worry or trouble?	70.5	6.6	12.9	7.3	2.7	
11	Have you felt bad or guilty about your gambling?	49.6	10.0	19.4	4.7	6.3	
12	Have you thought you shouldn't gamble or should gamble less?	47.5	9.0	24.4	12.4	6.4	0.3
13	How often has anyone close to you complained about your gambling?	71.6	14.1	7.8	3.7	2.8	
14	How often have you lied to others to conceal the extent of your involvement in gambling?	83.4	5.0	8.6	2.7	0.3	
15	How often have you hidden betting slips, Lotto tickets, gambling money or other signs of gambling from your spouse, partner, children or other important people in your life?	88.4	4.3	4.3	1.6	1.3	
		No	Yes				Missing
16	(a) Have you and your partner put off doing things together? If yes… (b) Was this made worse by your gambling?	90.4	3.2				6.4
17	(a) Have you and your partner criticised one another? (b) Was this made worse by your gambling?	84.7	8.9				7.0
18	(a) Has your partner had difficulties trusting you? (b) Was this made worse by your gambling?	89.2	4.5				6.4
19	How often have you spent more money on gambling than you can afford?	62.1	17.9	13.6	4.2	2.3	
20	How often has your gambling made it harder to make money last from one payday to the next?	74.2	10.3	11.3	3.3	1.0	
21	How often have you had to borrow money to gamble with?	90.2	4.8	4.0	0.7	0.3	

Note. Only Items 4 to 15 and Items 19 to 21 are used as a prevalence screen of problem gambling. For Items 16 to 18, responses were coded as 'yes', when both sub-questions a and b were answered affirmatively; the responses were coded as 'no' when one of the sub-questions was answered negatively. The percentages of missing responses are aggregated across both sub-questions.

Table 2:   The Canadian Problem Gambling Index (CPGI): Items and frequencies (in %)

No.	Item	Never	Rarely	Sometimes	Often	Always	Don't know/ refused
1	In the last 12 months, have you bet more than you could really afford to lose?	63.3	9.3	16.0	7.8	3.7	
2	In the last 12 months, have you needed to gamble with larger amounts of money to get the same feeling of excitement?	76.0	6.2	12.8	2.9	2.2	
3	In the last 12 months, when you gambled, did you go back another day to try to win back the money you lost?	67.5	8.1	14.7	7.1	2.6	
4	In the last 12 months, have you borrowed money or sold anything to get money to gamble?	88.5	3.9	3.6	2.5	1.5	
5	In the last 12 months, have you felt that you might have a problem with gambling?	73.7	2.0	16.0	2.9	5.3	
6	In the last 12 months, has gambling caused you any health problems, including stress or anxiety?	79.6	4.4	10.6	4.1	1.2	
7	In the last 12 months, have people criticised your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	79.7	4.7	9.3	5.1	1.1	
8	In the last 12 months, has your gambling caused any financial problems for you or your household?	82.8	3.3	9.2	3.1	1.5	
9	In the last 12 months, have you felt guilty about the way you gamble or what happens when you gamble?	58.0	9.1	22.0	7.2	3.7	
10	In the last 12 months, have you lied to family members or others to hide your gambling?	84.4	3.0	5.5	5.0	2.1	
11	In the last 12 months, have you bet or spent more money than you wanted to on gambling?	54.2	13.0	21.6	7.4	3.8	
12	In the last 12 months, have you wanted to stop betting money or gambling, but didn't think you could?	78.1	2.0	12.4	4.2	2.4	0.9

Note. Only Items 1 to 9 are used as a prevalence screen of problem gambling (Problem Gambling Score Index — PGSI). To be consistent with the original coding scheme, 'rarely' and 'sometimes' were conflated into a single response category in this study.

Table 3:   The South Oaks Gambling Screen (SOGS): Items and frequencies (in %)

No.	Item	Never	Rarely	Sometimes	Often	Always	Don't know/ refused
1	In the last 12 months, when you gambled, how often did you go back another day to win back money you lost?	54.0	13.4	16.2	9.3	7.1	
2	In the last 12 months, have you claimed to be winning money from gambling when in fact you lost?	81.5	8.4	5.8	1.3	2.5	0.4
3	In the last 12 months, have you gambled more than you intended to?	36.1	23.8	22.2	9.9	7.9	
4	In the last 12 months, have people criticised your gambling or told you that you have a gambling problem, regardless of whether or not you thought it was true?	73.7	11.9	8.2	3.2	2.8	0.3
5	In the last 12 months, have you felt guilty about the way you gamble or what happens when you gamble?	64.1	8.2	11.7	6.4	9.5	
6	In the last 12 months, have you felt that you would like to stop gambling but didn't think you could?	81.2	6.8	2.5	4.1	5.4	
7	In the last 12 months, have you hidden betting slips, lottery tickets, gambling money or other signs of gambling from your spouse/partner, children, or other important people in your life?	84.6	6.9	4.7	1.0	2.8	
8	(a) In the last 12 months, have you argued with people you live with over how you handle money?						
	(b) Have these money arguments centred on your gambling?	81.1	11.5	4.6	0.8	2.1	
9	In the last 12 months, have you borrowed from someone and not paid them back as a result of your gambling?	97.0	1.3	0.6	1.1		
10	In the last 12 months, have you lost time from work or study because of your gambling	95.5	3.7	0.8			
11	In the last 12 months, have you borrowed from household money to gamble or to pay gambling debts?	89.0	5.8	3.2	1.4	0.6	
12	In the last 12 months, have you borrowed from your spouse or partner to gamble or to pay gambling debts?	92.2	2.6	4.8			0.4
13	In the last 12 months, have you borrowed from other relatives or in-laws to gamble or to pay gambling debts?	91.5	5.1	2.3	1.1		
14	In the last 12 months, have you obtained cash advances using your credit cards to gamble or to pay gambling debts? This does not include using cards to make cash withdrawals from savings or cheque accounts.	85.7	4.9	7.5	1.2	0.7	
15	In the last 12 months, have you arranged a personal loan from a bank, finance company or credit union to gamble or to pay gambling debts?	98.1	1.3	0.7			
16	In the last 12 months, have you borrowed from loan sharks to gamble or to pay gambling debts?	100.0					
17	In the last 12 months, have you cashed in shares, bonds or other securities to gamble or to pay gambling debts?	96.2	2.6	1.2			
18	In the last 12 months, have you sold personal or family property to gamble or to pay gambling debts?	97.6	2.4				
19	In the last 12 months, have you written a cheque knowing there was no money in your account to gamble or to pay gambling debts?	98.9	1.1				

No.	Item	No	In the past	Yes, now			Missing
20	Do you feel you've ever had a problem with your gambling?	80.7	9.3	9.9			

Note.   All items are used as a prevalence screen of problem gambling. In line with the original coding scheme, the binary responses (yes/no) which preceded the more graded ratings were used for prevalence estimates. Question 8b did not include in a first step a binary response format, but rather a rating scale only, which was to be dichotomised and combined with the binary response of 8a. In error, this rating scale omitted the response option 'never'. To maintain the item for the screen, the rating for 8b was dichotomised by coding 'rarely' as 'no' and all other valid responses as 'yes'. When either 8a or 8b were responded to negatively (i.e. 'rarely' for 8b), the score was 0; when 8a and 8b were responded to positively (i.e. other than 'rarely' for 8b), the score was 1.

Content analysis

To analyse which facets and dimensions of problem gambling the three different screens contain, an inductive procedure was adopted. That is, similar items of one instrument were grouped and given a label that characterised their meaning; then these groupings and labels were used to sort the items of the next instrument as far as possible; otherwise groupings and labels were modified to fit the item contents of that screen. These groupings were then used to classify the items of the third screen as far as they fitted and otherwise modified, extended or reduced. Revised groupings were then, in a reiterative process, applied again to the first, second and third screen, until there was a satisfactory fit.

Of course, this procedure contains a degree of subjectivity and the outcome cannot be taken as the only possible classification of items. However, the results are instructive for the present purpose. Table 4 lists the categories generated and how all items of the three screens were grouped into these categories.

Focusing on the comparative features of the VGS, it can be seen that among its scoreable items ('harm to self' scale), there are two facets that are not represented in either the CPGI or the SOGS. These are 'preoccupation' (two items) and escapism (one item). In contrast, the VGS does not contain items on 'habituation' (represented in the CPGI with one item) and 'personal consequences' (represented with one item each in CPGI and SOGS).

The latter is rather surprising, given that the scoreable sub-scale of the VGS is supposed to measure 'harm to self'. Instead, the scoreable 'harm to self' scale in the VGS covers a variety of facets but not 'personal consequences' and is therefore a misnomer. 'Harm to self' does not seem an appropriate term for the diversity of items it covers; namely preoccupation, problem recognition, loss of control, escapism, chasing, money problems and lying/(self-) deception.

The original, more distinctive definition of problem gambling that was supposed to underlie the VGS focused on the harm of gambling on the individual player, his or her family and possibly the wider community.[41] From this perspective it seems rather unfortunate and inconsistent that the validation pilot study by Ben-Tovim *et al.* led practically to the exclusion of the 'harm to others' items from the VGS score.[42] There is only one item left that addresses harmful social consequences, no different from the CPGI or even the SOGS. Since the results of the pilot study should be regarded as preliminary, the inclusion of aspects of harm to others may be worth reconsidering, depending on how these items perform empirically.

Generally, it appears as if the three screens share most facets and do not differ as much in their content as their different theoretical models and aspirations would suggest. The only obvious difference between the three screens is the strong representation of money issues, specifically the borrowing of money from diverse sources, in the SOGS.

Distribution of responses

Tables 1, 2 and 3 also show the distributions of responses along the graded rating scales for all three screens. These distributions indicate the 'difficulty' of the single items; that is, the percentage of people surveyed who can actually respond to a question affirmatively.

Clearly, a question that is so extreme that no respondent ever answers 'yes', is useless as it does not help to differentiate between people along the dimension in question (i.e. non-problem versus problem gamblers). Items are more informative when they have a great degree of variance in the responses.

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[41] Ben-Tovim et al. 2001, op. cit, p. 23.

[42] More specifically, the harm-to-others scale (as well as the enjoyment of gambling scale) proved to be unrelated to problem gambling as diagnosed in validation interviews during development. Because they seemed to have little predictive or diagnostic value, these items were not further considered for the definition of VGS cut-off scores. See Ben-Tovim *et al.*, op. cit. pp.59-60.

As the tables show:

- Most of the items in all three screens are clearly skewed towards the 'no/never' end of the scale. This partly reflects the fact that indeed only a minority of regular gamblers have a gambling problem;

- Items that refer to people's admission that they should gamble less, that they gamble more than they can afford/intend to, or that they feel guilty about their gambling, are items with a greater frequency of positive responses and greater variance. These items are represented in all three gambling screens;

- In contrast, the items about borrowing money from various sources in the SOGS show an extreme level of negative responses. On this basis, these questions do not appear to be very good diagnostic items. Note that the question about borrowing from loan sharks (Item 16) has no variance at all.

Item difficulty

As a general indication of the degree of item difficulty (i.e. the probability of respondents giving an affirmative response) and item variance (i.e. the degree to which respondents differ in their responses), we can calculate the mean and standard deviation (i.e. variation) across the scales. The same response codes are used for all screens; that is all items are measured on a scale from 0 to 4. To obtain scale means we calculated the average across all items of a screen (which can of course range again from 0 to 4). The standard deviation is practically the average (absolute) deviation of responses from the mean:

- The mean scores of the CPGI (9-item scale) and the VGS (harm to self) scale were very similar, and both substantially larger than the mean score for the SOGS (Ms = 0.55 vs. 0.54 vs. 0.31);

- Moreover, the standard deviation of the CPGI score was slightly greater than for the VGS score, which in turn had a greater variance than the SOGS score (SDs = .81 vs. .73 vs. .39);

- Thus in terms of general item difficulty and variance, the CPGI fared best of all three screens. (Note: Only very few respondents had a missing value on a screen item. In each case, the missing value was replaced by the mean of the remaining valid responses.)

Table 4:   Content analysis of the three problem gambling screens

Categories		VGS No. Item	CPGI No. Item	SOGS No. Item
Gambling attitudes	Attitude, centrality, importance	*1 Has gambling been a good hobby for you?		
		*2 Nowadays, when you gamble, is it fun?		
		*3 Have you gambled with skill?		
Problem gambling behaviour	Preoccupation	6 Has gambling been more important than anything else you might do?		
		8 Has the thought of gambling been constantly on your mind?		
	Problem recognition	11 Have you felt bad or guilty about your gambling?	5 Have you felt that you might have a problem with gambling?	5 Have you felt guilty about the way you gamble or what happens when you gamble?
		12 Have you thought you shouldn't gamble or should gamble less?	9 Have you felt guilty about the way you gamble or what happens when you gamble?	20 Do you feel you've ever had a problem with your gambling?
	Loss of control	4 Nowadays, when you gamble, do you feel as if you are on a slippery slope and can't get back up again?	*11 Have you bet or spent more money than you wanted to on gambling?	3 Have you gambled more than you intended to?

Categories		VGS No. Item	CPGI No. Item	SOGS No. Item
		5 Has your need to gamble been too strong to control?	*12 Have you wanted to stop betting money on gambling, but didn't think you could?	6 Have you felt that you would like to stop gambling but didn't think you could?
	Escapism	10 Have you gambled in order to escape from worry or trouble?		
	Chasing	7 Have you felt that after losing you must return as soon as possible to win back any losses?	3 When you gambled, did you go back another day to try to win back the money you lost?	1 When you gambled, how often did you go back another day to win back money you lost?
	Habituation		2 In the last 12 months, have you needed to gamble with larger amounts of money to get the same feeling of excitement?	
	Money issues	19 How often have you spent more money on gambling than you can afford?	1 Have you bet more than you could really afford to lose?	9 Have you borrowed from someone and not paid them back because of your gambling?
		20 How often has your gambling made it harder to make money last from one payday to the next?	4 Have you borrowed money or sold anything to get money to gamble?	11 Have you borrowed from household money to gamble or pay gambling debts?
		21 How often have you had to borrow money to gamble with?	8 Has your gambling caused any financial problems for you or your household?	12 Have you borrowed from your spouse or partner to gamble or to pay gambling debts?
				13 Have you borrowed from other relatives or in-laws to gamble or to pay gambling debts?
				14 Have you obtained cash advances using your credit cards to gamble or to pay gambling debts? This does not include using cards to make cash withdrawals from savings or cheque accounts.
				15 Have you arranged a personal loan from a bank, finance company or credit union to gamble or to pay gambling debts?
				16 Have you borrowed from loan sharks to gamble or to pay gambling debts?
				17 Have you cashed in shares, bonds or other securities to gamble or to pay gambling debts?
				18 Have you sold personal or family property to gamble or to pay gambling debts?
				19 Have you written a cheque knowing there was no money in your account to gamble or to pay gambling debts?
	Lying, (self-) deception	9 Have you lied to yourself about your gambling?	*10 Have you lied to family members or others to hide your gambling?	2 Have you claimed to be winning money from gambling when in fact you lost?
		14 How often have you lied to others to conceal the extent of your involvement in gambling?		7 Have you hidden betting slips, lottery tickets, gambling money or other signs of gambling from your spouse/partner, children, or other important people in your life?
		15 How often have you hidden betting slips, Lotto tickets, gambling money or other signs of gambling from your spouse, partner, children or other important people in your life?		
Adverse consequences of gambling behaviour	Personal consequences		6 Has gambling caused you any health problems, including stress or anxiety?	10 Have you lost time from work or study because of your gambling?
	Social consequences	13 How often has anyone close to you complained about your gambling?	7 Have people criticised your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	4 Have people criticised your gambling or told you that you have a gambling problem, regardless of whether or not you thought it was true?
		*16 (a) Have you and your partner put off doing things together? (b) Was this made worse by your gambling?		8 (a) Have you argued with people you live with over how you handle money? (b) Have these money arguments centred on your gambling?

Categories	VGS No.	Item	CPGI No.	Item	SOGS No.	Item
	*17	(a) Have you and your partner criticised one another? (b) Was this made worse by your gambling?				
	*18	(a) Has your partner had difficulties trusting you? (b) Was this made worse by your gambling?				

Note. Starred items are not included in problem gambling scores.

To repeat, items with greater variance in responses are better equipped to differentiate between respondents. That is, assuming that the items are valid indicators of problem gambling, items with greater variance are more diagnostic for different degrees of problem gambling. The highest scoring items for the three screens, which naturally also tend to have greater variance, are as follows:

VGS (Table 5):

- Have you thought you shouldn't gamble or should gamble less?;

- Have you felt bad or guilty about your gambling?;

- Nowadays, when you gamble, do you feel as if you are on a slippery slope and can't get back up again?

CPGI (Table 6):

- In the last 12 months, have you felt guilty about the way you gamble or what happens when you gamble?;

- In the last 12 months, have you bet more than you could really afford to lose?;

- In the last 12 months, when you gambled, did you go back another day to try to win back the money you lost?

SOGS (Table 7):

- In the last 12 months, have you gambled more than you intended to?;

- In the last 12 months, when you gambled, how often did you go back another day to win back money you lost?;

- In the last 12 months, have you felt guilty about the way you gamble or what happens when you gamble?

Table 5:   VGS — Mean responses as an indicator of item difficulty

	Mean	Standard Deviation
Item 12[a]	1.21	1.33
Item 11	.88	1.24
Item 4	.72	1.26
Item 19	.67	1.01
Item 10	.65	1.12
Item 8	.61	1.10
Item 7	.55	1.13
Item 13	.52	.98
Item 9	.48	1.05
Item 20	.47	.89
Item 5	.38	.93
Item 14	.32	.77
Item 6	.25	.76
Item 15	.23	.72
Item 21	.16	.55

[a] Written descriptions of each item are provided in Table 1.

Table 6. **CPGI: Mean responses as an indicator of item difficulty, for the uniform five-point scale and the original scale**

	Uniform five-point scale		Original (four-point) scale	
	Mean	Standard Deviation	Mean	Standard Deviation
Item 9 [a]	.89	1.19	.57	.78
Item 1	.79	1.18	.52	.79
Item 3	.69	1.12	.45	.74
Item 5	.64	1.17	.40	.79
Item 2	.49	.97	.31	.64
Item 7	.43	.94	.28	.61
Item 6	.43	.92	.27	.59
Item 8	.37	.89	.23	.58
Item 4	.25	.77	.17	.53

[a] Written descriptions of each item are provided in Table 2.

Table 7. **SOGS: Mean responses as an indicator of item difficulty, for the uniform five-point scale and the original binary response scale (sorted for the former)**

	Uniform five-point scale		Original (binary) scale	
	Mean	Standard Deviation	Mean	Standard Deviation
Item 3 [a]	1.30	1.27	.58	.49
tem 1	1.02	1.31	.16	.37
Item 5	.89	1.37	.30	.46
Item 4	.49	.97	.20	.40
Item 6	.46	1.09	.13	.34
Item 2	.34	.86	.18	.39
Item 8	.31	.78	.07	.26
Item 7	.30	.84	.12	.33
Item 14	.26	.71	.13	.34
Item 20	.19	.40	.19	.40
Item 11	.19	.61	.09	.29
Item 13	.13	.47	.07	.26
Item 12	.12	.45	.07	.25
Item 9	.06	.36	.02	.15
Item 17	.05	.27	.04	.19
Item 10	.05	.26	.03	.18
Item 15	.03	.20	.01	.11
Item 18	.02	.15	.02	.15
Item 19	.02	.21	.01	.10
Item 16	.00	.00	.00	.00

[a] Written descriptions of each item are provided in Table 3.

Dimensionality

The three screens are supposed to indicate the propensity to problem gambling and are meant to provide a single score for each respondent that reliably and validly indicates this behavioural tendency. The construction of a single score assumes that the different items of one screen are indicators of one single psychological construct. Only when screen items can be considered indicators of one and the same dimension is an aggregation of item scores into a single score justified.

We can investigate statistically whether the items of a gambling screen are best represented by a single underlying dimension or whether they have to be thought of as indicators of a number of different dimensions (which could reflect different features of problem gambling). A test for the dimensionality (i.e. the number of underlying dimensions) of the different screens would be of heuristic interest as to the theoretical conceptualisation of problem gambling. Is problem gambling to be understood as a monolithic phenomenon, or is problem gambling a complex of behaviours and can thus take different forms? More important for the present purpose, however, a test of dimensionality addresses the methodological prerequisite: the idea of a problem gambling score assumes a unitary concept of problem gambling and thus requires that the instruments are indeed uni-dimensional and can be represented by a single score.

Factor analyses were used to address this question, using again the graded response format for all screens. For the VGS, including all 21 items:

- The factor analysis extracted three factors (with Eigenvalues greater than 1), which is consistent with the earlier evaluation study by Ben-Tovim *et al.* (2001). However, some 'harm to self' items showed substantial relationships to both the first two factors; no clear differentiation in meaning between the first two factors emerged. Only the third factor could be more clearly identified as 'enjoyment of gambling'— that is, only the first three VGS items that were supposed to measure enjoyment loaded on this factor;

- Moreover, the analysis produced a very strong first factor that accounted for 45 per cent of the variance, shadowing the relevance of the other two factors. On this factor, all items loaded sufficiently high (> .54) except for the three items referring to 'enjoyment of gambling' (see Table 8). Thus, 'harm to self' and 'harm to others' items need not be distinguished. In fact all the 18 remaining items could practically be aggregated into one score of problem gambling.

However, in this research we will follow the earlier research and build a score on the basis of the 15 'harm to self' items only, so as to be able to use the developed cut-off scores. Importantly, all 15 items form a single dimension and can be represented by a single score;

Tables 8, 9 and 10 summarise the main findings of the factor analyses, showing the factor loadings of all items on the first (unrotated) factor. In addition to the analysis discussed here in more detail, based on the graded rating format (the same for all three screens), Tables 9 and 10 also provide results for factor analyses using the original response categories of CPGI and the SOGS. The results were very much the same.

For the CPGI, including all 12 items of the problem gambling assessment section:

- The factor analysis produced a single factor that accounted for 64 per cent of variance. All 12 items loaded highly (> .68) on this factor and can be considered to represent a single concept of problem gambling (see Table 9);

- However, consistent with the earlier use of the CPGI, only the first 9 items will be included here for the construction of a problem gambling score (PGSI).

Table 8: VGS — Factor loadings and item-total correlations

	Factor loading (first factor)	Item-total correlations
Item 1 [a]	-.28	--
Item 2	-.39	--
Item 3	.04	--
Item 4	.72	.76
Item 5	.74	.71
Item 6	.74	.61
Item 7	.71	.70
Item 8	.70	.72
Item 9	.77	.72
Item 10	.70	.57
Item 11	.77	.77
Item 12	.73	.73
Item 13	.71	.65
Item 14	.78	.74
Item 15	.81	.59
Item 16	.55	--
Item 17	.58	--
Item 18	.79	--
Item 19	.68	.68
Item 20	.79	.79
Item 21	.61	.61
	45% of variance	Alpha = .94

[a] Written descriptions of each item are provided in Table 1.

Table 9:   CPGI: Factor loadings and item-total correlations

	Uniform five-point scale		Original (four-point) scale	
	Factor loading (first factor)	Item-total correlations	Factor loading (first factor)	Item-total correlations
Item 1 [a]	.85	.80	.85	.80
Item 2	.78	.71	.80	.73
Item 3	.71	.65	.69	.63
Item 4	.74	.66	.79	.72
Item 5	.88	.86	.85	.83
Item 6	.78	.74	.79	.74
Item 7	.69	.61	.72	.64
Item 8	.83	.80	.83	.80
Item 9	.82	.75	.87	.81
Item 10	.81	--	.80	--
Item 11	.77	--	.81	--
Item 12	.88	--	.88	--
	64% of variance	Alpha = .92	65% of variance	Alpha = .93

[a] Written descriptions of each item are provided in Table 2.

For the SOGS (item 16 needed to be excluded because of zero variance):

- The factor analysis extracted six factors (with Eigenvalues greater than 1). The factor structure was thus rather complex, relative to the number of items;

- Crucially, the first factor accounted for only 33 per cent of the item variance, considerably less than in the other two screens. Seven out of the 19 items failed to load substantially on this factor (< .50). Thus, there is little empirical basis that the items all measure the same concept, and their representation in terms of a single score does not seem warranted (see Table 10);

- As mentioned before, much of the heterogeneity in the SOGS could derive from the 'borrowing' items. The fact that one borrows from one source does not necessarily imply that one also borrows from another source (except if one is really desperate); rather it may mean that one does not need to borrow elsewhere;

- In any case, the factor analysis revealed an unintended heterogeneity and complexity in the SOGS, which puts in question its reliability and validity as a measure.

Table 10:   SOGS: Factor loadings and item-total correlations

	Uniform five-point scale		Original binary response	
	Factor loading (first factor)	Item-total correlations	Factor loading (first factor)	Item-total correlations
Item 1 [a]	.66	.64	.62	.54
Item 2	.09	.10	.18	.16
Item 3	.71	.67	.52	.45
Item 4	.69	.61	.67	.59
Item 5	.80	.77	.70	.62
Item 6	.77	.72	.69	.61
Item 7	.58	.54	.50	.41
Item 8	.77	.67	.58	.50
Item 9	.50	.38	.44	.32
Item 10	.31	.26	.35	.31
Item 11	.60	.48	.54	.45
Item 12	.39	.30	.42	.34
Item 13	.59	.46	.54	.41
Item 14	.53	.47	.50	.43
Item 15	.43	.38	.32	.27
Item 17	.36	.32	.39	.34
Item 18	.25	.21	.40	.33
Item 19	.49	.38	.36	.26
Item 20	.78	.72	.80	.73
	33% of variance	Alpha = .86	27% of variance	Alpha = .83

[a] Written descriptions of each item are provided in Table 3.

Internal consistency

Another indicator for the coherence of a psychometric scale is its internal consistency. Internal consistency refers to the degree to which all scale items are inter-correlated; where a high (low) score on one item would go together with a high (low) score on another item. Assuming that all items are measuring the same concept, a high internal consistency indicates little measurement error or high reliability.

The alpha coefficient is a summary statistic of the degree of inter-correlations between all items included in a scale. It can range from 0 to 1, with 1 indicating perfect inter-correlatedness of items. Tables 8, 9 and 10 show the alpha coefficients for the three screens; for the CPGI and the SOGS based on the uniform five-point scale as well as their original four-point and binary response categories, respectively. Only items that were used to build the scale (i.e. scoreable items) were included in these analyses.

The VGS and the CPGI both have very high degrees of internal consistency (> .92), which reflects their coherence and uni-dimensionality as well as their reliability of measurement. Tables 8 and 9 show that, for both screens, correlations between individual items and the total score of all scale items were very homogenous and sufficiently high (> .57). For the CPGI, this was also the case when the original four-point response scale was imitated.

In contrast, the SOGS had a lower alpha coefficient of .86 (and .83 for the binary response). This is still a satisfactory level of consistency. However the item-total correlations are much more heterogeneous and some of them low and insubstantial. That means the consistency of the scale would not be reduced (or could even be slightly increased) if these items were ignored.

Further, it should be noted that the alpha coefficient is affected by the number of items in the scale. It is generally higher the more items in the scale. That means the CPGI in particular shows a very high quality of internal consistency and inter-item reliability, as its high alpha-level is based on only nine items; the CPGI is the shortest of the three problem gambling screens.

Item weighting

For the aggregation into a summary problem gambling score, the question arises of how the individual item scores should be weighted. Should items that appear to be more central and more reliable indicators be given a comparatively greater weight? Or can all items be simply averaged or summed up for a total score (thus be weighted equally)?

The question of different item weightings can first be addressed empirically. We can investigate whether items are differently good indicators of the underlying dimension (in the factor analysis) or whether items contribute to different degrees to the total scale score (in item-total correlations). Assuming that items with greater factor loadings or greater item-total correlations are better or more central indicators of the underlying concept (problem gambling), we could weight items by their factor loadings or their item-total correlations.

However, such considerations would only be relevant if individual items indeed showed different degrees of centrality for the factor or total scale. For the VGS, for example, Table 8 indicates rather homogenous item-total correlations for the 'harm to self' scale, ranging between .57 and .79. All items seem to contribute fairly evenly to the total score. It would thus be rather doubtful whether a differential weighting of individual items would lead to a substantially different scale score. Our reliability and internal consistency analysis, at least, does not suggest substantially different weights.

This notion can be put to the test by investigating the correlation between weighted and unweighted item aggregations. For a weighted aggregate score of the VGS, factor scores from a factor analysis over all 15 relevant items can be used. Factor scores are respondents' scores on a factor which are basically a linear combination of single items weighted by their different factor loadings. Thus, items contribute differently to the meaning of a factor, in line with their centrality to the factor.

The correlation between VGS factor scores and the unweighted average or sum scores is $r = .998$. That means factor scores and plainly aggregated scores are virtually identical. This suggests that there is no advantage in weighting individual items differently to obtain a VGS score. At least, this is the case for weights based on our factor analysis.

Second, however, we could also weight items differently based on theoretical considerations. If there were strong theoretical reasons to give greater weight to some items rather than others, more radically different item weights could of course be chosen. However, in the development of the VGS, no such theoretical arguments were put forward, and indeed the pilot study used only plain sum scores.[43] Accordingly, the present research uses the sum of unweighted individual items as problem gambling scores.

Construct validity

Item distribution, uni-dimensionality and internal consistency are all psychometric qualities of an instrument that contribute to the reliability of measurement; that is, how well it measures what it measures. However, in order to find out whether an instrument indeed measures what it is supposed to measure, we require some external criterion. For instance, for the validation of gambling screens, it is a common procedure to have psychologists determine in in-depth interviews whether or not the respondents have a gambling problem. This assessment can then be used as a 'gold standard' (i.e. as if it is a true and unbiased assessment) with which the scores of the gambling screen can be correlated, in order to establish how well the screen 'predicts' the expert assessment. Unfortunately, with large-scale surveys, this would require a great number of costly qualitative interviews.

Alternatively, we can use other self-reports from the survey as 'pseudo-external' criteria for the validation of the screening instruments. Of course, these criteria are not 'gold standards' (but neither are in-depth interviews as they also have measurement issues). They are not superior to the screens in terms of their reliability or validity of measurement. However, they may be important correlates of the behaviour in question (problem gambling). Therefore, a screen that has a high level of validity should also be highly correlated with these correlates. This procedure is more commonly referred to as construct validation.

A first correlate of problem gambling is the degree to which people perceive their gambling habit as a problem. This problem recognition is in fact usually part of measures of problem gambling, and it is thus not an ideal criterion to evaluate the construct validity of the screens (see Table 4). Nonetheless, the survey included an additional self-rating of people's gambling problem on a response scale from '1 = not at all a problem', to '10 = a serious problem'. Its correlations with the three screens are displayed in Table 11.

All three screens are highly correlated with the self-rating of problem gambling, with correlations greater than .7 (except when the SOGS is used with its binary response scale). The CPGI is most strongly correlated with the self-rating.

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[43]   See Ben-Tovim *et al.* 2001, op. cit.

Table 11: Construct validity of the three gambling screens

Correlate	VGS	CPGI		SOGS	
		Five-point scale	Four-point scale	Five-point scale	binary (no/yes)
Self-rating of problem	.75***	.82***	.81***	.73***	.68***
Wanting help	.66***	.65***	.63***	.53***	.53***
Family history	.24**	.28***	.28***	.18*	.15
Gambling as escapism	.43***	.43***	.42***	.40***	.46***
Stress	.24**	.41***	.40***	.12	.15
Depression	.36***	.55***	.54***	.49***	.46***
Suicidal tendencies	.36***	.44***	.46***	.27***	.23**

Note. $^*p < .05, ^{**}p < .01, ^{***}p < .001$

Other survey correlates of problem gambling are:

- Wanting help (In the past 12 months, have you wanted help for problems related to your gambling? no/yes);

- Family history (Has anyone in your immediate family ever had a gambling problem? no/yes);

- Gambling as escapism (In the last 12 months, if something painful happened in your life, did you have the urge to gamble? no/yes);

- Stress (In the last 12 months, have you been under a doctor's care because of physical or emotional problems brought on by stress? no/yes);

- Depression (In the last 12 months, have you felt seriously depressed? no/yes); and

- Suicidal tendencies (Have you seriously thought about or attempted suicide as a result of your gambling? no/yes).

Obviously, not everybody wants help even when they have a severe gambling problem; not all problem gamblers have a family history of gambling; and so on. These issues are not definitional criteria for problem gambling. However, they tend to be correlated with problem gambling, and therefore it can be argued a more valid gambling screen should be more highly correlated with these issues than a less valid screen.

Table 11 shows the correlations for these problem gambling correlates with the three screens. As can be seen, gambling as escapism is equally and strongly correlated with all three screens.

The same is true for wanting help, which generally is even more strongly correlated with the problem-gambling screens; the correlations tend to be slightly higher for the VGS and the CPGI than for the SOGS.

Self-reported depression is fairly evenly and strongly correlated with the problem gambling screens, the correlations being slightly weaker for the VGS and strongest for the CPGI. Self-reported stress is most strongly correlated with the CPGI, more moderately correlated with the VGS and not significantly related to SOGS scores.

Similarly, suicidal tendencies show the strongest correlations with the CPGI and somewhat less strong for the VGS, while they are only moderately correlated with the SOGS. A similar pattern can be found for family history, which generally seems a less close correlate of problem gambling. However, it is most closely correlated with CPGI scores and least with SOGS scores.

Overall, the CPGI has the strongest relationships with the correlates of problem-gambling investigated here. Even if only a matter of degree, the CPGI appears to have the best construct validity of the three screens. In other words, because scores for the CPGI show the closest relationships to variables which correlate theoretically to aspects of problem gambling, it seems that we should be most confident that the CPGI, of the three screens, most closely measures what it is supposed to measure — problem gambling.

Classification validity

The previous section used the continuous scores of the problem gambling screens to investigate their construct validity. This is an appropriate procedure, because any reduction of a continuous scale into discrete categories implies a premature loss of information. However, at some stage, namely when statements about the prevalence rates of problem gambling are desired, we need to apply cut-off points that are supposed to separate non-problem from problem gamblers.

Previous evaluation studies have suggested such cut-off points for the three screens. Namely, using their original scoring, for the VGS (harm to self scale) a score of 21+, for the CPGI a score of 8+ and for the SOGS a score of 5+ have been used to define and identify problem gamblers.

This raises another issue of validity, namely whether the problem screens with their established cut-off points lead to the valid categorisation of problem gamblers. Ideally, a screen would identify as problem gamblers those participants who have a gambling problem, and it would identify as non-problem gamblers those who do not have a gambling problem. Conversely, the screen should not identify as problem gamblers people who actually do not have a gambling problem (false positives), and it should not identify as non-problem gamblers those who indeed have a gambling problem (false negatives).

Lacking an external criterion and the knowledge which survey participants are truly problem gamblers and who is not, we need to resort to the correlates of problem gambling to evaluate the classification validity of the three screens. The Productivity Commission used a similar approach and tested the degree to which classification of non-problem and problem gamblers corresponded to self-reports of harmful impacts of gambling.[44] For instance, a cross-tabulation showed that 41.4 per cent of respondents with a SOGS score of 5+ did in fact not report any harmful impact (as measured by the Productivity Commission's notional HARM indicator). Conversely, 32.7 per cent of respondents who reported a harmful impact (according to HARM) had a SOGS score of less than 5. These figures could be interpreted as 'false positive' and 'false negative' classifications.

While an equivalent approach is used here, it needs to be emphasised that the results cannot be compared directly, because different correlates are used. Similarly, the figures cannot be interpreted in an absolute sense, because the correlates themselves are not 'gold standard' indicators of problem gambling. More instructive is therefore the comparison of validation results between different screens employed in any one study.[45]

Table 12 shows the cross-tabulations of classified non-problem and problem gamblers relative to each of the six dichotomous correlates of problem gambling. It also displays the percentage of:

- Positively identified problem gamblers who score negatively on the respective correlate, which we may call here 'false positives' (This is crude terminology because the correlate is of course not a necessary criterion for problem gambling); and

- Respondents with positive scores on the respective correlate who failed to be identified as problem gamblers, which are called here 'false negatives'. (Again, this is crude terminology because not all of the correlates are sufficient criteria for problem gambling; however some may be so, such as wanting help and suicidal tendencies due to gambling habits.)

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[44]   Productivity Commission, op. cit., pp. 6.28-6.33.
[45]   Ferris, J. and Wynne, H., 2001, op. cit.

Table 12: **Classification validity for the three gambling screens**

Correlate		VGS: problem gambling No	Yes	CPGI: problem gambling No	Yes	SOGS: problem gambling No	Yes
Wanting help	no	133	9 (47.4%)[a]	117	6 (27.3%)	117	19 (63.3%)
	yes	3 (23.1%)[b]	10	2 (11.1%)	16	3 (21.4%)	11
Family history	no	116	13 (68.4%)	104	11 (50.0%)	96	19 (65.5%)
	yes	21 (77.8%)	6	15 (57.7%)	11	24 (70.6%)	10
Gambling as escapism	no	122	11 (57.9%)	112	12 (57.1%)	115	18 (62.1%)
	yes	14 (63.6%)	8	7 (43.8%)	9	5 (31.3%)	11
Stress	no	120	15 (78.9%)	110	12 (54.5%)	111	25 (83.3%)
	yes	16 (80.0%)	4	9 (47.4%)	10	7 (58.3%)	5
Depression	no	114	11 (61.1%)	106	6 (27.3%)	106	13 (44.8%)
	yes	23 (76.7%)	7	13 (44.8%)	16	14 (46.7%)	16
Suicidal tendencies	no	133	16 (84.2%)	119	18 (81.8%)	119	28 (96.6%)
	yes	4 (57.1%)	3	0 (0.0%)	4	1 (50.0%)	1
Average 'false positives'			66.3%		49.7%		69.3%
Average 'false negatives'		63.1%		34.1%		46.4%	

[a]   Percentage of classified problem gamblers who score negatively on the correlate ('false positives'), here relative to all classified problem gamblers.

[b]   Percentage of classified non-problem gamblers who score positively on the correlate ('false negatives'), here relative to all classified problem gamblers.

The results from this analysis are most easily grasped when the percentages of false positives and false negatives are averaged across the six correlates (see bottom rows of Table 12). Note again that the percentages in Table 12 cannot be interpreted in an absolute sense as reflecting the degree to which the screens misclassify gamblers, because the correlates are not strict external criteria for problem gambling. However, the findings are instructive in a relative sense, namely for a comparison between the three screens. It can be seen that the CPGI has, on average, the lowest number of false positives and the lowest number of false negatives of the three problem gambling screens. This suggests that the CPGI is the superior screen in terms of its classification validity.

However, because none of the correlates alone can be considered a necessary condition for problem gambling, the statistic for 'false positives' should not be overemphasised. For instance, the fact that somebody does not want help for gambling problems does not necessarily imply that that person is not a problem gambler.

In contrast, some of the correlates may be considered sufficient conditions for regarding somebody as a problem gambler. For instance, somebody who wants help for gambling problems is likely to have (at least subjectively) a gambling problem. A screen that fails to identify a number of such cases would be deficient. A similar argument can be made for gambling as escapism, gambling-related stress, depression and suicidal tendencies — but not family history.

Excluding family history, the average percentage of cases that a screen did not identify as problem gamblers even though they scored positively on a behavioural criterion (e.g. seeking help) is again lowest for the CPGI (24.5 per cent), higher for the SOGS (34.6 per cent) and still higher for the VGS (50.1 per cent). In particular, even though the general number of respondents with gambling-related suicidal tendencies was rather low (which reduces the reliability of this indicator), it is a rather poor result for the VGS to have missed several such serious cases.

Since the percentages of 'false positives' and 'false negatives' are rather similar for the VGS, it is not immediately obvious how its classification validity could be improved by an adjustment of cut-off scores. The issue of cut-off scores will be addressed further in the following sections, first with a view on the prevalence rates that the different screens indicate.

Comparison of prevalence rates

What prevalence rates of problem gambling do the three screens now indicate for the adult population of Victoria? In this study, the three screens were administered only to respondents classified as regular gamblers on the basis of their involvement in gambling behaviour. Out of the 8,479 survey participants, 525 (or 6.2 per cent) of the weighted sample were classified as regular gamblers. It is assumed that no problem gambling is found among non-regular gamblers; thus only regular gamblers were screened by one of three problem gambling screens. Hence, the probability of being a problem gambler in our sample needs to be multiplied by the probability of being a regular gambler, in order to obtain the probability of being a problem gambler in the general population.

Among regular gamblers, the VGS identified 12.0 per cent, the CPGI identified 15.6 per cent and the SOGS identified 19.7 per cent as problem gamblers, based on the established thresholds of the three screens. Multiplying these rates with the probability of being a regular gambler (0.062) yields estimates for one-year prevalence rates of problem gambling in the general adult population. Table 13 shows the estimates, standard errors and confidence intervals for the prevalence estimates.

Table 13:   One-year prevalence rates of problem gambling in the Victorian adult population

Instrument	(Cut-off score)	Prevalence estimate	Standard error	Confidence interval at 95% probability
VGS	(21+)	0.74%	0.16%	0.42% − 1.06%
	(15+)[a]	1.22%	0.21%	0.82% − 1.62%
CPGI	(8+)	0.97%	0.18%	0.61% − 1.33%
SOGS	(5+)	1.12%	0.20%	0.73% − 1.51%

Note. Because each of the three problem gambling screens was practically administered to a random subset of the total sample, the calculation of standard errors uses a third of the total *n* (8,479/3=2,826) as the appropriate sample size.

[a]   Evidence discussed in the following sections of this report suggests that a cut-off score of 15+ could be more appropriate for the VGS. Prevalence results for such a revised cut-off score are already included in this table for easy comparison.

Note that the cut-off score for the VGS is based on a small-scale validation study whose results have to be considered preliminary.[46] Ben-Tovim *et al.* conducted clinical interviews of a small sample of 71 gamblers to identify problem gamblers. Based on this assessment, it was determined that a cut-off score of 21 for the VGS balanced best the objectives of minimising false negatives and minimising false positives.

Alternatively, however, the interviews also used DSM-IV criteria to determine whether or not participants should be diagnosed as 'pathological gamblers'. When this diagnosis was instead used as a criterion, an optimal cut-off point of 14 was determined. Applying this cut-off score to the present research, the VGS would define 20.6 per cent of regular gamblers as pathological gamblers. That is, an estimated 1.28 per cent of the Victorian population would have been pathological gamblers in the last 12 months. This one-year prevalence rate is close to the estimate based on the SOGS, which, interestingly, has also been modelled on DSM-IV criteria.

Next to 'problem gambling', the various screening instruments have been used to identify other, less problematic groups of gamblers, thus allowing a more graded classification of gamblers into different risk groups.

For the VGS, Ben-Tovim *et al.*'s pilot study had interviewers also identify 'borderline gamblers' next to problem gamblers. Taking the interview outcomes as valid criteria, the authors determined cut-off points for three categories of gamblers: non-problem gamblers (VGS score of 0 to 8), borderline gamblers (9–20), problem gamblers (21+).[47]

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[46]   Ben-Tovim *et al.* op.cit.

[47]   Ben-Tovim *et al.* op.cit

Likewise, the CPGI is assumed to distinguish four gambler groups: non-problem gamblers (CPGI score of 0), low-risk gamblers (1–2), moderate-risk gamblers (3–7) and problem gamblers (8–27).[48]

Finally, on the basis of SOGS scores, Lesieur and Blume distinguished between non-pathological gamblers (SOGS score of 0–2), possible pathological gamblers (3–4) and probable pathological gamblers (5+).[49] Often also a group of severe problem gamblers is defined as having a SOGS score of 10+ (e.g. the Productivity Commission's *National Gambling Survey* 1999; *Survey of the Nature and Extent of Gambling and Problem Gambling in the ACT* 2001).

However, we cannot reasonably assume that gamblers with a low or moderate risk of having or developing a gambling problem cannot also be found among non-regular gamblers. Because screens were only administered to regular gamblers in the present research, we can only estimate the prevalence of the various gambling groups among regular gamblers, but not among the general population. The one-year prevalence rates of the different groups among regular gamblers are shown in Table 14.

Table 14:   One-year prevalence rates of different levels of problem gambling among regular gamblers

Instrument and gambling sub-groups (cut-off scores)	Prevalence estimate	Standard error	Confidence interval at 95% probability
VGS			
Non-problem gamblers (score 0–8)	72.7%	3.6%	65.7%–79.7%
Borderline gamblers (9–20)	15.4%	2.9%	9.7%–21.1%
Problem gamblers (21+)	12.0%	2.6%	6.9%–17.1%
CPGI			
Non-problem gamblers (0)	37.9%	4.1%	29.9%–45.9%
Low-risk gamblers (1–2)	31.9%	3.9%	24.2%–39.6%
Moderate-risk gamblers (3–7)	14.7%	3.0%	8.9%–20.5%
Problem gamblers (8+)	15.6%	3.1%	9.6%–21.6%
SOGS			
Non-pathological gamblers (0–2)	65.9%	3.9%	58.3%–73.5%
Possible pathological gamblers (3–4)	14.4%	2.9%	8.8%–20.0%
Probable pathological gamblers (5–9)	13.2%	2.8%	7.8%– 8.6%
Severe problem gamblers (10+)	6.5%	2.0%	2.5%–10.5%

Across all three gambling screens we found that:

- Around 70 per cent of regular Victorian gamblers did not have a gambling problem over the one-year period;

- Around 15 per cent of regular gamblers were borderline cases with a moderate risk of having (or possibly developing) a gambling problem; and

- About another 15 per cent of surveyed regular gamblers in Victoria seemed to have had a gambling problem in the past twelve months.

Thus, the VGS with the cut-off points suggested on the basis of the earlier VGS pilot study indicates prevalence rates that are, overall, not too dissimilar to the ones indicated by the CPGI and the SOGS. Nonetheless, it appears that a cut-off of 21+ defines problem gamblers somewhat more narrowly than the other two screens do, and in particular compared to the SOGS. However, the alternative cut-off of 14+ (also suggested in the pilot study) produces for the VGS a prevalence rate that is more similar to the rate based on the SOGS.

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[48]   Ferris and Wynne op.cit

[49]   Lesieur and Blume op.cit.

Score distributions

Because, the VGS pilot study results were only a first empirical basis for the development of cut-off points for the VGS, it will here be investigated whether the present data can inform that decision further.

First, as suggested in the draft scoping study, the distribution of problem gambling scores can be investigated for any signs of multi-modality (multiple peaks) that can suggest distinctive sub-groups in the sample. The score distributions for the VGS, CPGI and SOGS are displayed in Figures 2, 3 and 4.

For the VGS, there appear to be at least four distinctive peaks, or groups of peaks, that suggest sub-groups of gamblers. The arrows in the graph indicate where boundaries could be drawn to distinguish these sub-groups and thus where cut-off points could be set; namely at 9, 15 and around 20. The first and larger group thus described could be considered as low problem gamblers, the next group borderline gamblers, then problem gamblers and the last group severe problem gamblers — but this would of course be rather arbitrary labels.

Interestingly, these cut-off points coincide quite well with the findings from the VGS pilot study. This earlier study also found a cut-off of 9+ for borderline gamblers and a cut-off of 21+ for problem gamblers, when interview classifications were used as the validation criterion. However, it found a cut-off score of 14 when the DSM definition of pathological gamblers was used.

Our earlier analysis yielded for a cut-off of 14+ a prevalence of problem gambling that was close to the estimate based on SOGS (only slightly higher), but higher than the estimate based on CPGI. The distributional analysis here may suggest a slight adjustment to a cut-off of 15+. The corresponding prevalence rate would then be 1.22, exactly as for the SOGS.

As to the score distributions of the other two screens, first, the findings for the CPGI are not very clear. After the very first large peak of low-problem gambling follows an indistinguishable wavy pattern. The distribution does not give us many clues as to where to draw the cut-offs. For the SOGS the distribution shows more distinct groups. After the first rapid decline in frequencies, there are peaks at scores of 3 and 6. The pattern is quite consistent with the established scores. In particular, a score of 5+ seems to characterise problem gamblers, while a score of 3 and 4 indicates borderline problem gamblers (or whatever labels we want to chose).

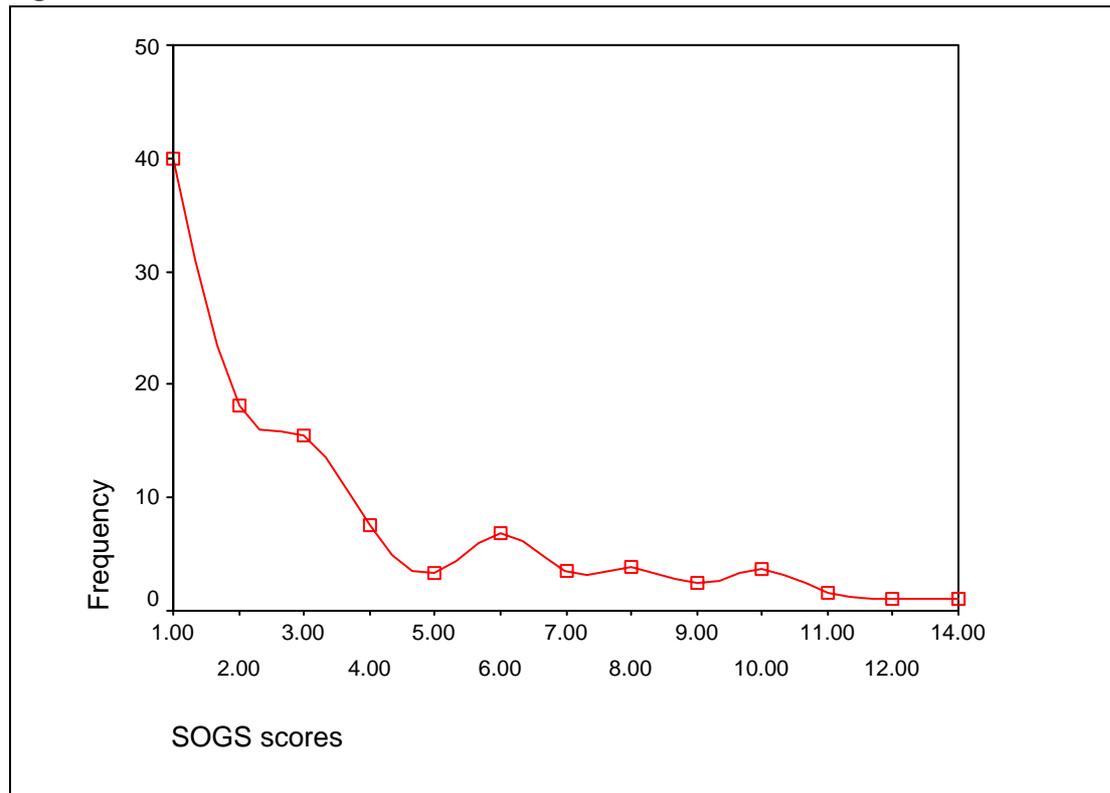**Figure 2: Distribution of VGS scores**
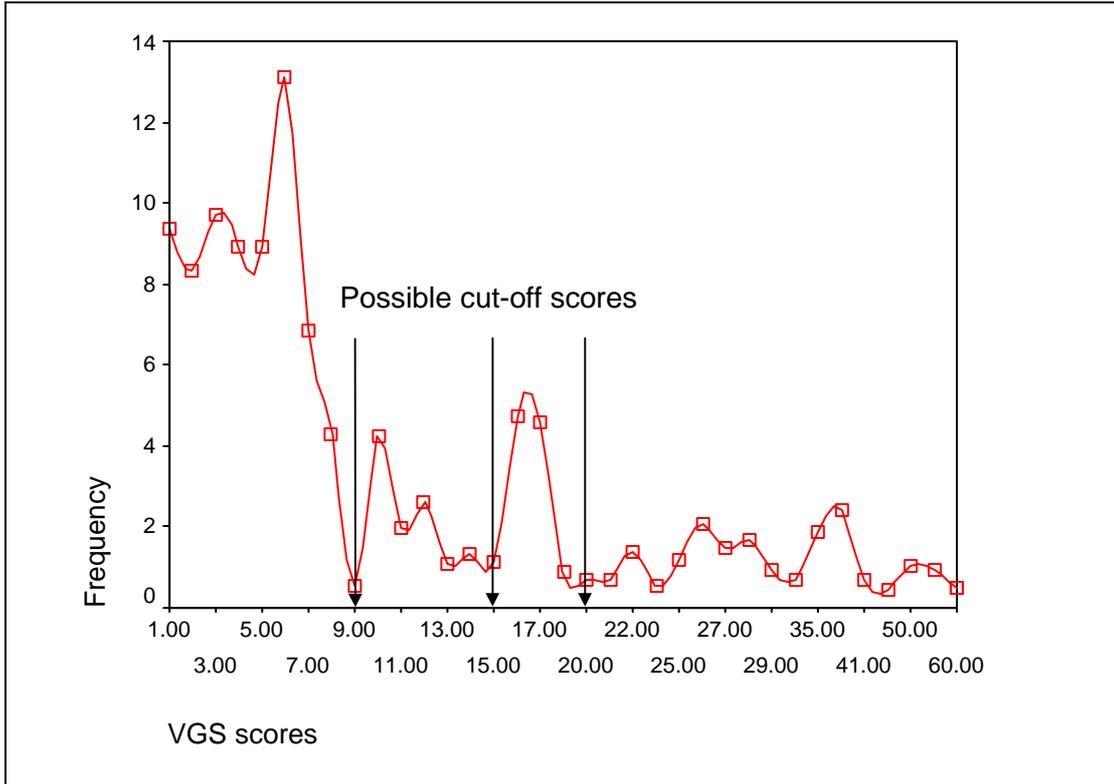
Note. In Figures 2 to 4, a score of 0 has been omitted.

Figure 3: Distribution of CPGI scores
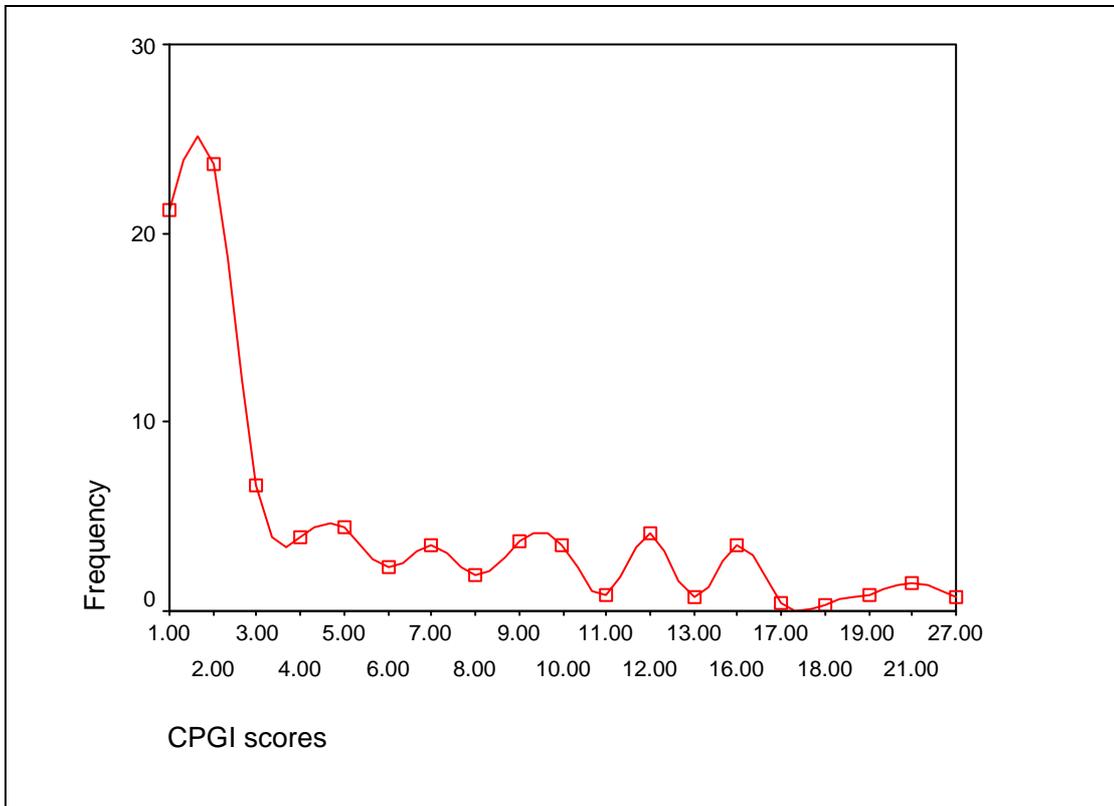
Note. In Figures 2 to 4, a score of 0 has been omitted.

Figure 4:   Distribution of SOGS scores

Note. In Figures 2 to 4, a score of 0 has been omitted.

Criterion-based cut-off analysis

The analysis of score distributions cannot do more than provide hints for possible sub-groups and possible cut-off scores. Another approach is again based on an external criterion and attempts to determine which cut-off score optimises an instrument's balance between sensitivity and specificity for the phenomenon to be identified.

Sensitivity refers to the ability of a problem gambling screen to correctly identify problem gamblers; thus avoiding 'false negatives' decisions of not identifying cases as problem gamblers who indeed are problem gamblers. Specificity refers to the ability of a problem gambling screen to correctly identify non-problem gamblers; thus avoiding 'false positives' decisions of identifying cases as problem gamblers who are actually non-problem gamblers.

Technically, this analysis can be done by means of the Receiver Operating Characteristic (ROC) analysis, which plots the likelihood of 'false negatives' decisions (1-sensitivity) against the likelihood of 'false positives' decisions (1-specificity) for each possible scale score as cut-off points.[50]

Because the present survey research does not offer a truly external criterion, we need to resort again to problem gambling correlates for this approach. As discussed in the section on 'Classification Validity' (p.48), the problem with these correlates is that they cannot be considered more valid or more reliable indicators of problem gambling. Specifically, these correlates (i.e. suffering from depression) are unlikely to be necessary conditions for being a problem gambler. Hence, the present analysis has to be taken with caution.

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[50]   The ROC analysis is not possible for data with fractional weights; therefore the analysis is here based on unweighted data.

Two alternative correlates will be used here. First, the question of whether respondents had wanted help for problems related to their gambling is used as a criterion. This variable reflects a subjective sense of having a problem that respondents feel they cannot overcome on their own (while ignoring the issue of whether they actually sought help or not). This should be a relatively precise indicator of problem gambling; the indicator constitutes a sufficient condition for problem gambling and comes closest to a necessary condition among all our correlates.

Second, the item of wanting help was combined with the three questions of gambling-related suicidality, feelings of depression and stress. Note that for the latter two issues the gambling-related nature was not explicit. Note also that the issue of escapism (see 'Classification Validity' p.48) was ignored here, because the VGS itself contained one item that captured this aspect. The four relevant questions were combined in a way that, if at least one of these four states was present, this was taken as an indicator of problem gambling. Hence, this constituted a rather broad and vague indicator of problem gambling and should lead to relatively low cut-off scores.

The analysis focuses here on the VGS. The results of the ROC analysis for wanting help as criterion are displayed in Figure 5. The graphs for sensitivity and specificity cross each other at a score of 16. Thus, a cut-off score of 16 would optimise the balance between both objectives, when the self-reported desire for help is taken as criterion.

The results for the ROC analysis with the combined correlates (wanting help, suicidality, depression and stress) as criterion are displayed in Figure 6. As can be seen the two graphs for sensitivity and specificity cross each other between scores of 5 and 6. This would indicate a cut-off of 5 or 6, which would be considerably lower than the cut-off of 9 that our earlier distributional analysis and the pilot study by Ben-Tovim *et al*. suggested for borderline gamblers.

As mentioned before, the combined correlates might itself be over-inclusive as criterion and the analysis must be viewed with caution. It suggests, however, a grey area of at-risk gambling between VGS scores of 5 and 16. Indeed, if we now revisit the distribution of VGS scores in Figure 2, we can see that a score of 5 may indeed be the lower boundary of another peak and subgroup of low-scoring gamblers, which may be called low-problem gamblers.

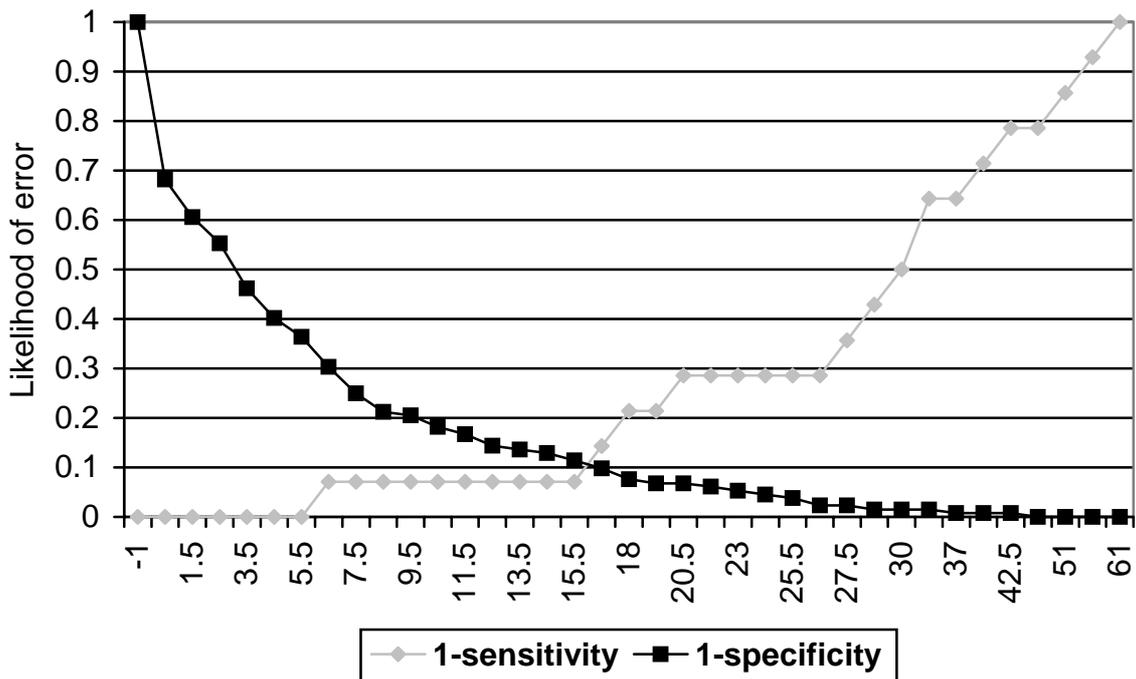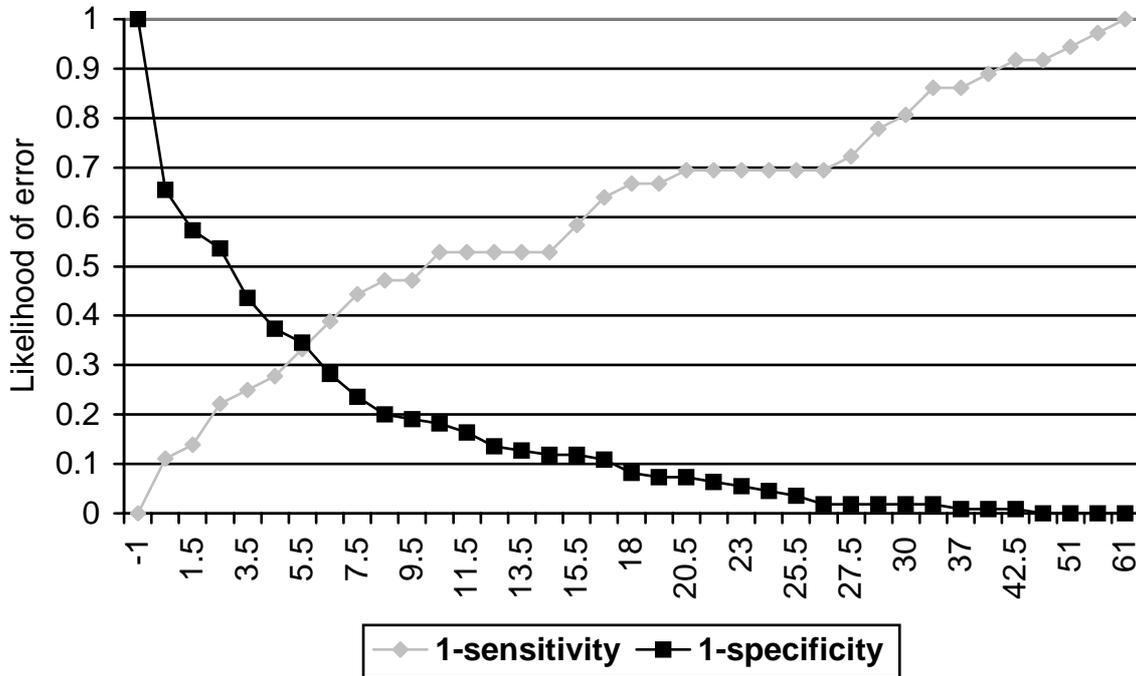**Figure 5:   ROC analysis for the VGS — Wanting help as criterion.**

Figure 6:   ROC analysis for the VGS: Combined correlates as criterion.

The cut-off score of 16, as suggested by the ROC analysis for wanting help as criterion, is a more than plausible cut-off score for problem gambling. It lies within the range of 14 and 21 that was suggested by the VGS pilot study on the basis of DSM criteria and in-depth interviews, respectively. It is also fairly consistent with the empirical evidence from our distributional analysis discussed earlier that suggested a cut-off at 15.

The prevalence rates of problem gambling based on a VGS cut-off score of 16 would be 1.18 per cent and thus not much different from a cut-off score of 15 (1.22 per cent). Whether 15 or 16 should be taken as a cut-off score cannot be further determined on the basis of the present data; indeed, it is probably a question of differentiation that no empirical study could answer unequivocally. However, we can now revisit the issue of classification validity.

Revised classification validity

We can now investigate how a revised cut-off score would affect the classification validity for the VGS. We basically repeated the analysis from the section on 'Classification Validity' on page 48, now with cut-off scores of 15 and 16. Table 13 shows the findings for all three cut-off scores in direct comparison with each other.

Table 15:   Classification validity for the VGS with different cut-off scores.

Correlate		Cut-off of 21+		Cut-off of 15+		Cut-off of 16+	
		No	Yes	No	Yes	No	Yes
Wanting help	no	133	9 (47.4%)[a]	124	18 (60.0%)	125	17 (58.6%)
	yes	3 (23.1%)[b]	10	1 (7.7%)	12	1 (7.7%)	12
Family history	no	116	13 (68.4%)	108	21 (67.7%)	109	20 (66.7%)
	yes	21 (77.8%)	6	17 (63.0%)	10	17 (63.0%)	10
Gambling as escapism	no	122	11 (57.9%)	116	16 (53.3%)	116	16 (55.2%)
	yes	14 (63.6%)	8	8 (36.4%)	14	9 (40.9%)	13
Stress	no	120	15 (78.9%)	115	20 (64.5%)	115	20 (66.7%)
	yes	16 (80.0%)	4	9 (45.0%)	11	10 (50.0%)	10
Depression	no	114	11 (61.1%)	108	17 (54.8%)	108	17 (56.7%)
	yes	23 (76.7%)	7	16 (53.3%)	14	17 (56.7%)	13
Suicidal tendencies	no	133	16 (84.2%)	125	24 (80.0%)	126	23 (79.3%)
	yes	4 (57.1%)	3	0 (0.0%)	6	0 (0.0%)	6
Average 'false positives'			66.3%		63.4%		63.9%
Average 'false negatives'		63.1%		34.2%		36.4%	

[a]   Percentage of classified problem gamblers who score negatively on the correlate ('false positives'), here relative to all classified problem gamblers.

[b]   Percentage of classified non-problem gamblers who score positively on the correlate ('false negatives'), here relative to all classified problem gamblers.

The results show a substantial decrease in the relative number of 'false negatives' across all correlates when the cut-off scores are relaxed to 15 or 16, while at the same time the relative number of 'false positives' did not increase (it rather decreased a bit as well). Most significantly, with a revised cut-off score of 15 or 16, the VGS no longer failed to identify respondents who reported suicidal tendencies as a result of their gambling.

There were no substantial differences between cut-off scores of 15 and 16 in terms of their classification accuracy. Overall, however, a cut-off of 15 provided the best results, yielding the lowest rates of 'false negatives' and 'false positives'. With a cut-off score of 15, the VGS is equal to the CPGI in terms of a low rate of 'false negatives'; however, the CPGI again achieved a better result for the rate of 'false positives'.

Conclusions

Performance of the VGS

To summarise the evidence for the quality of the VGS as a problem gambling screen:

- Content analysis shows that the VGS covers facets of problem gambling that are rather similar to the CPGI, and both screens do not differ very much from the SOGS. This is despite the fact that the developers of VGS and CPGI claimed to reject the clinical theoretical model underlying SOGS. The SOGS, however, does include an excessive number of items about the borrowing of money for gambling;

- In its current form the VGS does not seem to realise the theoretical claim to regard problem gambling predominantly in terms of harm — 'harm to self', others and the community. The VGS does not contain any explicit items referring to consequences for oneself and, following the pilot study, 'harm-to-others' items were practically excluded from a problem gambling score;

- The distribution and variance of responses for the items of the VGS was generally good (as good as for the CPGI and better than for the SOGS). This is a precondition for a screen being able to differentiate between respondents;

- An analysis of the factor structure underlying all VGS items did not replicate the findings of the pilot study. There was no consistent distinction between so-called 'harm to self' and 'harm-to-others' questions, as both loaded on one main factor. The scoreable ('harm to self') items reflected a single factor, which is a precondition for the aggregation of responses into a single problem gambling score;

- The internal consistency of the scoreable items of the VGS (scoreable according to the pilot study) was excellent — as good as for the CPGI and better than for the SOGS. The scoreable VGS items were thus consistently highly interrelated, which is a precondition for reliable measurement;

- The construct validity of the VGS, assessed on the basis of its interrelations with problem gambling correlates, was satisfactory — slightly better than for the SOGS, but not as good as for the CPGI. This means that we could have somewhat greater confidence that the CPGI measures what it is supposed to measure: problem gambling;

- Results for classification validity, that is the degree to which a screen can correctly classify problem gamblers, might be considered the most problematic result for the VGS. While our analyses lacked a clear external criterion, the findings suggest that the VGS constitutes no improvement over the SOGS, and its result was significantly worse than for the CPGI. This suggests problems with the definition of cut-off scores;

- In the 2003 Victorian *Longitudinal Community Survey* the prevalence rate of problem gambling as estimated on the basis of the VGS and a cut-off score of 21+ (as suggested by the VGS pilot study) was 0.74 per cent. This was significantly lower than for the CPGI (0.97 per cent) and the SOGS (1.22 per cent). An alternative cut-off score of 14+ (also indicated by the VGS pilot study) yielded a prevalence rate of 1.28 per cent;

Overall, the VGS performed fairly well and seems to be an improvement over the SOGS — specifically in terms of one-dimensionality, internal consistency, item distributions and, to some degree, construct validity.

However, the CPGI demonstrated at least equally good qualities on all these dimensions, plus considerably better classification validity. Given that the CPGI is also shorter and thus more economical than the VGS, the present data analysis would seem to support the adoption of the CPGI as a problem gambling screen.

Although the analyses of classification validity needs to be viewed with caution because no truly external classification criterion was available in this research, the disappointing findings for the VGS suggest problems with the definition of its cut-off scores. The VGS estimates of problem gambling prevalence corroborate this conclusion. Thus, further improvements of the VGS would mainly have to focus on the adjustment of cut-off scores for the definition of problem gamblers and borderline gamblers. Clarification of items that measure 'harm to self' and social aspects of harm consistent with the screens theoretical objectives also is warranted.

Suggested modifications to the VGS

Modifications to the substance of the VGS may be considered. As we observed, the VGS does not contain any items regarding personal harm and no (scoreable) harm-to-others items, which is at odds with its underlying definition of problem gambling. A problem in the development of the VGS may have been that although it began with promising top-down conceptual work on the specific elements of problem gambling and a clarification of the theoretical framework, the subsequent item formulation and item selection were very much a bottom-up process, based on focus groups and pilot samples. Of course, the first-hand experience of many participants involved in the focus groups was probably very valuable. The problem, however, is that the results can, to some extent, reflect conventional stereotypes or, at least, a variety of (lay) premises about problem gambling that may not coincide with research or theory.

The findings of the present research suggest that harm-to-others items could be included in the VGS for a general problem gambling score, as they loaded on the same main factor. This would strengthen the component of social harm in the screen. However, if so, a further recommendation would be to reformulate the items to avoid a hierarchical question format (i.e. two sub-questions). It might have been the case in the pilot study that the harm-to-others items constituted their own factor merely because of their peculiar format, rather than their content reflecting a different dimension. Instead, the items could each be worded in a single question, such as 'Did your gambling cause arguments with others?'; 'Did your gambling make your partner lose trust in you?' and 'Did your gambling make you and your partner put off doing things together?'

Second, if the substance and number of scoreable items are not to be changed, then the definition of the cut-off scores might need to be adjusted. The present findings suggest a cut-off of 15+ based on the following evidence:

- The distribution of VGS scores suggested three (or four) sub-groups of gamblers that can be separated by the scores 9 and 15 (and around 20, but the last group had a less distinctive shape);

- In a criterion-related analysis, the optimal balance between sensitivity and specificity was 16 for 'wanting help' as a narrow criterion and 5 or 6 for the combined correlates as a broad criterion;

- The classification validity for a cut-off score of 15 was superior to the original analysis with a cut-off of 21 (and slightly better than for a cut-off of 16); and

- The estimated prevalence rate based on a VGS score of 15+ was 1.22 per cent and thus exactly the same rate as for the SOGS (with cut-off 5+).

The empirical indications for a cut-off score for borderline problem gambling were less clear. The score distribution first suggested a score of 9+, which is consistent with the findings of the pilot study. The criterion-related analysis, in contrast, suggested a lower cut-off score of 5 or 6. However, the combination of correlates used in this analysis can only be viewed as a broad and inclusive criterion, but not specifically as a criterion for borderline cases. Nonetheless, the distribution of VGS scores also suggested another subgroup of low-scoring gamblers between scores of 5 and 9.

So perhaps it may be useful to distinguish four groups of gamblers, for which we then find the following prevalence estimates among regular gamblers:

- Non-problem gamblers (0–4): 51.3 per cent;

- Low-problem gamblers (5–8): 21.4 per cent;

- Borderline problem gamblers (9–14): 7.6 per cent; and

- Problem gamblers (15+): 19.7 per cent (and 1.22 per cent in the total adult population).

However, while we attempted to inform decisions about cut-off scores and the distinction between gambling groups with empirical evidence, we reiterate that such decisions are ultimately arbitrary and mere conventions. In the end, it depends on how we want to communicate findings from population screenings, and what we want to communicate. The definition of a cut-off score for problem gambling makes sense; it is in the public and political interest to have valid estimates which roughly measure the extent of problem gambling and how it develops over time. However, a cut-off score for low-problem gambling or borderline gambling may not communicate and mean very much, as long as these categories themselves lack theoretical definition and meaning.

Limitations and future research

While the present study was instructive as to the relative performances of the three screens and possible ways to improve the VGS, it suffers from two limitations.

First, the sample sizes were lower than desirable. As explained earlier, the predicted number of regular gamblers on which the sampling frame was based did not materialise. Further, a proportion of those regular gamblers discontinued the interview prematurely. As a consequence, each screen could only be administered to about 150 respondents, which is a sub-optimal empirical basis.

In this study budget constraints are very much the reason for such tight planning and presented a dilemma for our validation analysis, as they would for any future study with similar goals. The study had the objective of validating the screens on the basis of a *wide range* of the gambling population. The screens thus needed to be applied to a random sample of the general population, of which only six percent may be regular gamblers. To obtain a larger sample of regular gamblers (which past research suggests is the sensible base for screening for gambling problems), we would need to start off with a much larger and more costly base sample of, say, 20,000 respondents. Alternatively, of course, we could sample from respondents who are more likely to be regular gamblers (e.g. recruiting and interviewing them at venues) so that a large base population sample is not required. This would be more economical, but there would be the risk that the recruited sample is not representative of all gamblers.

In either case, however, sample sizes per screen can be increased if only two screens, not three, are evaluated in comparison with each other. We suggest ignoring the SOGS in future validation research. A sample of regular gamblers could then be divided between only two screens; or if the survey was focussed only on prevalence rates it may be possible to apply both screens (VGS, CPGI) to the same sample.

The second limitation of the present study is the lack of an external criterion for validation purposes. Usually, validation studies use diagnoses from in-depth clinical interviews as a 'gold standard' to measure the quality of a problem gambling screen. Obviously, in the present study it would have been extremely costly for researchers to interview 433 regular gamblers to establish whether they have a gambling problem. However, future research should at least subject a random selection of respondents to clinical interviews for the purpose of criterion validation.

In this context, however, we want to repeat our caution that clinical interviews are also not a 'gold standard':

- First, they also depend on respondents' self-report, which is acknowledged as problematic;

- Second, clinicians are likely to have their own personal models or conceptions of problem gambling, which may in fact be less consistent and less explicit than the theories underlying the construction of problem gambling screens. Alternatively, clinicians are frequently trained in certain sets of diagnostic criteria (e.g. DSM-IV), which amount to just another screen applied in a less standardised manner;

- Third, clinical interviews have their own reliability and validity issues, but these are rarely checked empirically and the extent of defects is therefore unknown.

On the other hand, clinicians should use the VGS and the CPGI with caution. These screens were developed to screen for problem gambling in population research, not to serve as a diagnostic tool for clinical purposes.

Finally, the validation of problem gambling instruments cannot be based on a single test of validity alone (e.g. criterion validation). Rather, it requires a broad range of psychometric indicators, many of which have been investigated in the present study.

General conclusions for an Australian gambling screen

The present findings indicate that the VGS may be a useful tool to estimate problem gambling prevalence in the Australian context. It certainly constitutes an improvement over the widely used SOGS which proved problematic in many respects in this research, as it has in other studies. At the same time, it needs to be noted that the content of the VGS and its implicit meaning of problem gambling do not seem to differ very much from the SOGS, contrary to claims of a departure from that theoretical model.

Furthermore, the CPGI demonstrated overall the best measurement properties of all three gambling instruments investigated here. This raises the question of whether more effort and resources should be invested in further refinements of the VGS; and whether indeed the VGS or the CPGI should be used in future Australian or Victorian population studies.

As well as the essential questions about screen validity, however, it would be advantageous to have prevalence estimates that can be easily compared across Australian states/territories and with international prevalence rates; that is, estimates based on a widely and internationally used and accepted instrument. An instrument which is most likely to be used in all Australian states/territories and internationally would provide meaningful comparisons. A considerable advantage of the SOGS is that its widespread use until recently has made interstate and cross-national comparisons possible. Despite these benefits, however, the SOGS has proved unsatisfactory and should be replaced in this role.

In contrast, the VGS has been used in this general population survey only. To our knowledge no other Australian jurisdiction has indicated its intention of using the screen in the near future. Moreover, if the VGS is to be considered and promoted as a national gambling screen in Australia, then major adjustments seem required, most importantly in the definition of cut-off scores. The present research gives empirical indications as to where the cut-offs could reasonably be drawn. The evidence clearly converges on a cut-off of 15+ for the definition of problem gambling. While the present study provided some benchmarks in this respect, future studies will need to continue to reflect critically on these measurement issues.

Even with further refinements and successful validation studies, however, application of the VGS as an Australian gambling screen will prevent comparisons with international research. It is doubtful if a uniquely Australian gambling screen would be acceptable to or adopted by the international research community.

The CPGI, on the other hand, has already been applied successfully in Queensland and now in Victoria. It also has rapidly emerged as the screen of choice in population studies across the Canadian provinces and it has been, or is being, used in prevalence studies of cultural communities in Toronto and Alberta. The Canadian Federal Government, through Statistics Canada, has invested heavily in the CPGI insofar as the screen has recently been used in the national Mental Health and Wellbeing Survey. The CPGI has also been applied internationally in general population studies in Denmark and Iceland. This presents the prospect of cross-national collaborative research and access to an expanding international data set (currently $n = 50,000$).

The most significant disadvantage of adopting the CPGI as a general problem gambling screen in Australia would be the implication for longitudinal studies and trend analysis if a different screen is adopted than has been used in past surveys. On balance, however, evidence from this validation study suggests that the CPGI offers the best outcomes in terms of screen validity, and considerable potential benefits as a future Australian gambling screen. The nine-item problem gambling score of the CPGI is also shorter and thus more economical to administer than the VGS. It would thus provide an acceptable standardised measure that would allow for interstate comparisons and, ultimately, for the development of a national problem gambling profile.

However, the CPGI, like the VGS, is a relatively new screen and is subject to modification. Indeed, we have been informed that refinements are currently being considered to accommodate the findings from several completed Canadian studies.[51] If the CPGI is to be endorsed as a national gambling screen in Australia, it is essential to quickly establish close collaboration with Canadian researchers to keep up-to-date with this process and to participate in further modifications to the screen.

One important issue for further research and consideration is whether any of the existing instruments do in fact represent an appropriate understanding of problem gambling, particularly in a culturally diverse society such as Australia, or whether further development and refinement of their present content facets are required.

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[51]   Wynne, H. 2003, personal correspondence.

Appendix A: References

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

American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders 1980; and *3rd ed.* 1987.

Australian Institute for Gambling Research 2001. *Survey of the Nature and Extent of Gambling and Problem Gambling in the ACT*. Report prepared for the ACT Gambling and Racing Commission, Canberra.

Battersby, M., Thomas, L., Tolchard, B. and Esterman, A. 2002. 'The South Oaks Gambling Screen: A review with reference to Australian use', *Journal of Gambling Studies*, 18, pp. 257–271.

Ben-Tovim, D., Esterman, A., Tolchard, B. and Battersby, M. 2001. *The Victorian Gambling Screen*, Report prepared for the Victorian Casino and Gaming Authority, published by the Gambling Research Panel.

Blaszczynski, A. and Nower, L. 2002. 'A pathways model of pathological and problem gambling'. *Addictions* 97(5), pp. 487–499.

Brodie, M. 2003. Queensland Policy Directorate, personal communication.

Dickerson, M., Baron, E., Hong, S-M. and Cottrell, D. 1996. 'Estimating the extent and degree of gambling related problems in the Australian population: A national survey'. *Journal of Gambling Studies*, 12, pp. 161–178.

Dickerson, M., McMillen, J., Hallebone, E., Volberg, R., and Woolley, R.. 1997. *The Definition and Incidence of Problem Gambling.* Melbourne: Victorian Casino and Gaming Authority.

Ferris, J. and Wynne, H. 2001a. *The Canadian Problem Gambling Index: Final Report.* Submitted to Canadian Centre on Substance Abuse.

Ferris, J. and Wynne, H. 2001b. *The Canadian Problem Gambling Index: User Manual.* Report to the Canadian Inter-Provincial Task Force on Problem Gambling.

Gambling Policy Directorate 2001. *Queensland Household Gambling Survey,* Queensland Government Treasury, Brisbane.

Lattimore, R., and Phillips, R. 2000. 'The impacts of legal gambling and the prevalence of problem gambling in Australia'. Paper presented at the 11th International Conference on Gambling and Risk Taking, MGM Grand Casino, Las Vegas, June 12–16, 2000.

Lesieur, H. and Blume, S. 1987. 'The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers'. *The American Journal of Psychiatry, 144*(9), pp. 1184–8.

McMillen, J., Marshall, D., Ahmed, E. and Wenzel, M. 2003. *The 2003 Victorian Longitudinal Community Attitudes Survey*. Report prepared for Gambling Research Panel.

Melbourne Enterprise International 2003. *Evaluation of the Victorian Gambling Screen.* Gambling Research Panel, Melbourne.

Orford, J., Sproston, K., and Erens, B. 2003. 'SOGS and DSM IV in the British gambling prevalence survey: Reliability and factor structure', *International Gambling Studies*, 3 (1), pp. 53–65.

Productivity Commission 1999. *Australia's Gambling Industries*, Report No. 10, AusInfo, Canberra.

Shaffer, H. (2003) 'A critical view of pathological gambling and addiction', in G. Reith (ed.), *Gambling: Who Wins? Who Loses?* Amherst, NY: Prometheus Books.

Smith, G.J. and Wynne, H.J. 2002. *Measuring gambling and problem gambling in Alberta using the Canadian Problem Gambling Index*. Report prepared for the Alberta Gaming Research Institute. February 2002

Thomas, S. and Jackson, A. 2003. *Project 1a. Scoping Study of the Victorian Gambling Screen.* Draft report prepared for the Gambling Research Panel, July 2003.

Walker, M. and Dickerson, M. 1996. 'The prevalence of problem and pathological gambling: A critical analysis', *Journal of Gambling Studies*, 12, pp. 233–249.

Wynne, H. 2003. Wynne Resources, Alberta. Personal communication.

Appendix B:
Problem gambling screens

Victorian Gambling Screen (VGS)[52]

Questions are asked for 'the last 12 months'. Items are answered using the scale: never/rarely/sometimes/often/always.

1.   Has gambling been a good hobby for you?
2.   Nowadays, when you gamble, is it fun?
3.   Have you gambled with skill?
4.   Nowadays, when you gamble, do you feel as if you are on a slippery slope and can't get back up again?
5.   Has your need to gamble been too strong to control?
6.   Has gambling been more important than anything else you might do?
7.   Have you felt that after losing you must return as soon as possible to win back any losses?
8.   Has the thought of gambling been constantly in your mind?
9.   Have you lied to yourself about your gambling?
10.   Have you gambled in order to escape from worry or trouble?
11.   Have you felt bad or guilty about your gambling?
12.   Have you thought you shouldn't gamble or should gamble less?
13.   How often has anyone close to you complained about your gambling?
14.   How often have you lied to others to conceal the extent of your involvement in gambling?
15.   How often have you hidden betting slips, Lotto tickets, gambling money or other signs of gambling from your spouse, partner, children or other important people in your life?

For the following questions, record response as Yes or No. These questions are only applicable if respondent has a partner.
If no partner or significant other code N/A and continue with Q19.

16.   Have you and your partner put off doing things together?
16a. If yes, was this made worse by your gambling?
17.   Have you and your partner criticised one another?
17a. If yes, was this made worse by your gambling?
18.   Has your partner had difficulties trusting you?
18a. If yes, was this made worse by your gambling?

For the following questions use the scale: Never – rarely – sometimes – often – always.

19.   In the past 12 months……….
20.   How often have you spent more money on gambling than you can afford?
21.   How often is your gambling made it harder to make money last from one pay day to the next?
22.   How often have you had to borrow money to gamble with?

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[52]   Ben Tovim, D., Esterman, A., Tolchard, M. 2001. *The Victorian Gambling Screen.* Gambling Research Panel: Melbourne.

South Oaks Gambling Screen (SOGS) Lifetime version (adapted to 'past 12 months' for this survey)

1. When you gamble, how often do you go back another day to win back money you lost? (never; some of the time [less than half the time] I lost; most of the time I lost; every time I lost)

2. Have you ever claimed to be winning money gambling but weren't really? In fact you lost? (never or never gamble; yes, less than half the time I lost; yes, most of the time)

3. Do you feel you have ever had a problem with gambling? (no; yes, in the past, but not now; yes)

4. Did you ever gamble more than you intended to? (yes, no)

5. Have people criticised your gambling? (yes, no)

6. Have you ever felt guilty about the way you gamble or what happens when you gamble? (yes, no)

7. Have you ever felt like you would like to stop gambling, but didn't think you could? (yes, no)

8. Have you ever hidden betting slips, lottery tickets, gambling money, or other signs of gambling from your spouse, children or other important people in your life? (yes, no)

9. a) Have you ever argued with people you live with over how you handle money? (yes, no)
    b) If you answered yes to the previous question: Have money arguments ever centred on your gambling? (yes, no)

10. Have you ever borrowed from someone and not paid them back as a result of your gambling? (yes, no)

11. Have you ever lost time from work (or school) due to gambling? (yes, no)
    If you borrowed money to gamble or pay gambling debts, who or where did you borrow from? (check 'yes' or 'no' for each).

12. From household money? (yes, no)

13. From your spouse? (yes, no)

14. From other relatives or in-laws? (yes, no)

15. From banks, loan companies, or credit unions? (yes, no)

16. From credit cards? (yes, no)

17. From loan sharks? (yes, no)

18. You cashed in stocks, bonds or other securities? (yes, no)

19. You sold personal or family property? (yes, no)

20. You borrowed on your checking account? (passed bad checks)? (yes, no)

Source: Lesieur and Blume op.cit., p.118.

Canadian Problem Gambling Index (CPGI)[53]

Dimensions	Variables	Indicators	Items and question numbers
Gambling Involvement	Type/Frequency	Gambling activities	1. How often did you bet or spend money on (list activities: daily weekly monthly yearly)?
	Duration	Time at play/type/session	2. Would you please try to tell me the number of hours or minutes you normally spend each time on (___)?
	Expenditure	Money wagered monthly	How much money, not including winnings, do you normally spend on this activity in a month?
		Largest amount wagered	What is the largest amount of money you ever gambled on this activity in any one day?
Problem Gambling Behavior	Loss of control	Bet more than could afford	5. Have you bet more than you could really afford to lose?
		Bet or spent more than wanted to	15. Have you bet or spent more money than you wanted to on gambling?
	Motivation	Increase wagers	6. Have you needed to gamble with larger amounts of money to get the same feeling of excitement?
	Chasing	Returning to win back losses	7. When you gambled, did you go back another day to try to win back the money you lost?
	Borrowing	Borrowing or selling for money to gamble	8. Have you borrowed money or sold anything to get money to gamble?
	Lying	Lied to family members or others	14. Have you lied to family members or others to hide your gambling?
	Problem recognition	Felt might have problem	Have you felt that you might have a problem with gambling?
		Wanted to stop, didn't think could	16. Have you wanted to stop betting money or gambling, but didn't think you could? (NOT SCORED)
Adverse Consequences	Personal Consequences	Negative effects on health	Has gambling caused you any health problems, including stress or anxiety?
		Criticism	11. Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
	Social Consequences	Financial problems	12. Has your gambling caused any financial problems for you or your household?
		Feelings of guilt	13. Have you felt guilty about the way you gamble or what happens when you gamble?
Problem Gambling Correlates	Faulty cognition	Due for a win after losses	17. After losing many times in a row, you are more likely to win?
		Have a winning system	18. You could win more if you use a certain system or strategy?
	First experiences	Remember big win	19. Do you remember a big win when you first started gambling?
		Remember big loss	20. Do you remember a big loss when you first started gambling?
	Family problems	Family gambling problem	21. Has anyone in your family ever had a gambling problem?
		Family alcohol/drug problem	22. Has anyone in your family ever had an alcohol or drug problem?
	Co-morbidity	Alcohol/drugs/gambling use	23. In the last 12 months, have you used alcohol or drugs while gambling?
		Gambling under the influence	24. Again, in the last 12 months, have you gambled while drunk or high?
		Admit alcohol/drug problem	In the last 12 months, have you felt you might have an alcohol or drug problem?
	Relieve pain	Self-medication (gambling, drinking or drug use)	If something painful happened in your life did you have the urge to gamble?
			If something painful happened in your life did you have the urge to have a drink?
			If something painful happened in your life did you have the urge to use drugs or medication?
	Stress	Treated for stress	Have you been under a Dr's care because of physical or emotional problems brought on by stress?
	Depression	Feelings of depression	Have you felt seriously depressed?
	Suicide	Suicide ideation/attempts	Have you seriously thought about or attempted suicide as a result of your gambling?

53   Ferris & Wynne, 2001. *The Canadian Problem Gambling Index: User Manual.* Report to the Canadian Inter-Provincial Task Force on Problem Gambling; Queensland Treasury. 2001. *Queensland Household Survey*, p.6.