Are scratchcards addictive? : two-year cumulative incidence and stability of pathological scratchcard gambling among Dutch scratchcard buyers

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Citation for published version (APA):

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CHAPTER 7

GENERAL DISCUSSION

In this final chapter, the major findings regarding the addictive potential of scratchcards and the assessment of gambling-related problems are summarised, discussed and placed within the context of recent scientific developments. Furthermore, methodological issues that are key to an accurate interpretation and extrapolation of our findings are addressed. Finally, several recommendations are made from a public health perspective and suggestions for future research are given.

OVERVIEW OF THE RESULTS

Prevalence and temporal stability of pathological scratchcard gambling

The current findings provide strong scientific evidence that pathological scratchcard gambling (PSG) is a rare phenomenon among Dutch adult scratchcard buyers. The last-year prevalence of scratchcard-related problems was 2.68% and only a small minority (0.24%) of the scratchcard gamblers met the DSM-IV criteria for pathological gambling adapted for scratchcards (see Chapter 2). The estimated two-year cumulative incidence also was 0.24%. In addition, the stability (or chronicity) of PSG was low (between 11.1 and 42.9%—best- and worst-case scenarios). This means that even in the “worst-case scenario” more than half of the pathological gamblers no longer fulfilled the adapted DSM-IV criteria two years after the first assessment. When the 2-year follow-up stability and incidence data were taken into account, the adjusted last-year prevalence estimate for PSG among scratchcard buyers was somewhere between 0.23 and 0.33% (Chapter 3). All these figures show that, over time, some new cases will appear (incidence) and some of the pathological scratchcard gamblers will recover, resulting in an overall stable and low PSG prevalence. The disorder can thus be said to be a rare phenomenon among Dutch adults scratchcard buyers. The present prevalence estimates pertain to adult scratchcard buyers only. If we take into account that in 1999 the penetration rate of scratchcards in the Dutch general adult population was 19%, the prevalence of PSG for the general adult population can be estimated at 0.046% (0.029% for the ‘combined’ and 0.017% for the ‘unique’ group of pathological scratchcard gamblers, see Chapter 2).


1 ‘Unique’ PSG is defined as meeting DSM-IV criteria for pathological scratchcard gambling but not for other forms of gambling. ‘Combined’ PSG is defined as meeting DSM-IV criteria for both PSG and pathological gambling involving other games of chance.
aforementioned studies ranged from 39% to 77%. For example, the prevalence study conducted in New Zealand reported high recovery rates (77%) among problem gamblers over a 7-year period (Abbott, M. W., Williams, M. M., & Volberg, R. A., 1999). The results of Wiebe and colleagues (2003) seem to indicate that, whereas high-risk gambling or moderate gambling problems appear to be transitory states, those gamblers suffering severe problems are much more stable. However, the latter finding seems questionable given the results of our study reported in Chapter 3, which suggests that also PSG is a disorder with low stability. On the other hand, the findings discussed in Chapter 4 did reveal that the players diagnosed with PSG that had recovered during the follow-up period were those that had reported less severe symptoms (GPSS) and fulfilled fewer symptom criteria (DIS-T) at the initial assessment than those players in the same group that did not recover. The differences in the recovery rates reported by these various studies may not only be accounted for by the severity of the gambling-related problems but also by the heterogeneity in the groups of gamblers investigated. More specifically, gamblers playing different games of chance were classified as gamblers in general, thus disregarding the type of game as a potential variable influencing the severity and development of gambling problems. The disparate findings point to the importance of a further examination the effects the severity of gambling-related problems has, as well as the role that specific forms of gambling (e.g., slot machines vs. scratchcards) play in the stability of and recovery from gambling problems.

In summary, the prevalence of pathological scratchcard gambling has been shown to be low, stable over time and is associated with a high recovery rate (as assessed in a two-year follow-up). When the DSM-IV criterion for clinical significance (Chapter 4), was taken into account, it was concluded that the previously reported prevalence of ‘unique’ PSG among a representative population of Dutch scratchcard gamblers (0.09%) is likely to be a serious overestimation of the real prevalence.

Clinical picture of pathological scratchcard gamblers
What are the characteristics of pathological scratchcard gamblers (PSG)? From those gamblers identified as being afflicted by PSG, approximately two thirds (0.15%) were also addicted to other hazard games like slot machines or casino games. This ‘combined’ PSG group resembles the demographic and gambling characteristics of pathological gamblers in general (young men, mainly slot-machine players). The remaining one third (0.09%) were ‘unique’ PSG with some very specific characteristics: this group mainly consisted of middle-aged women who spent relatively small amounts of money on scratchcards (Chapter 2). Given that pathological gambling is generally more prevalent among men and that the group of unique PSG mainly consisted of women players, our finding corroborates the suggestion made by Grupta and Deverensky (1998) that women are more specifically attracted to particular games of chance such as scratchcards. With this unique PSG group, our study may have identified a new group with very specific characteristics within the pathological gambling spectrum. Moreover, this unique PSG group is not to be found in treatment settings; the only pathological scratchcard gamblers seen in the clinical practice belong to the
combined group, which makes the unique group even more exceptional\(^2\). This fact was also mentioned in a German study (IPM, 1993). Combined PSG seems to be part of a more general pathological gambling problem, one that developed prior to the onset of the gambling problems related to scratchcards. This finding suggests that scratchcard gambling is not a stepping-stone towards other more harmful forms of gambling (Chapter 2). Additionally, the incidence cases resemble the prevalence cases in terms of comorbidity of pathological scratchcard gambling with an addiction to other games of change. Although both groups, unique and combined PSG, met the DSM-IV criteria for PSG, the gamblers in the combined group scored positive on more South Oaks Gambling Screen items and DSM-IV criteria for scratchcards than those who were only addicted to scratchcards (unique PSG) at both prevalence and incidence assessments. Moreover, the combined group also fulfilled more DSM-IV criteria with respect to their addiction to other games of chance than with respect to their addiction to scratchcards (Chapter 3). These results confirmed that the level of impairment or distress associated with their scratchcard-related problems was higher for the gamblers in the combined group than it was for those in the unique PSG group.

Our findings on PSG seem to lend support to one of the hypotheses presented by Toce-Gerstein and colleagues that the DSM-IV criterion Illegal Acts relating to criminal behaviour due to a person's gambling losses may demarcate the most severe level of pathological gambling. It should be noted, however, that our sample did not confirm their data that the symptom most reported by all players classified as PSG is *Chasing* but rather *Preoccupation with gambling*, followed by *Escapism, Loss of control and Tolerance* (Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A., 2003). Despite our congruent results, the severity of gambling problems needs to be more extensively tested with validated severity instruments like the GPSS and with larger samples before any definitive conclusions can be drawn.

THE ASSESSMENT OF GAMBLING-RELATED PROBLEMS

As pointed out in the introduction of this thesis (Chapter 1), if one wishes to establish whether and to what extent a specific form of gambling is addictive, and thus potentially dangerous to the player and his/her environment, it is essential that one has suitable, validated instruments at one's disposal that allow a reliable assessment of the consequences that playing such a game of chance has in the general population. It is equally important that within the group of problem gamblers the severity of the gambling-related problems as well as the different life domains affected by their adverse behaviours can be accurately evaluated. Therefore, this thesis included the validation of the Dutch version of the South Oaks Gambling Screen (Chapter 5) and the development of a new instrument to assess the severity of gambling problems, i.e. the Gambling Problems Severity Scale (Chapter 6).

\(^2\) In January 2004, several treatment centres specialised in the treatment of addictions confirmed this finding.
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Validity of the Dutch version of the South Oaks Gambling Screen
Chapter 5 confirmed that the Dutch version of the South Oaks Gambling Screen (SOGS) is a valid screener for pathological gambling according to the DSM diagnostic criteria for pathological gambling in the general population. Although the SOGS has been widely used in epidemiological studies, to our knowledge, this was the first community study in Europe to use a two-stage design to test the SOGS validity against the DSM-III-R diagnostic criteria.

The specificity rate (0.99) reported in this study is comparable to the ones reported in other studies, whereas the sensitivity rate (0.94) is considerably higher in our sample than those reported in other general population samples (Abbott, M. W. & Volberg, R. A., 1996; Stinchfield, R., 2002; etc.). The positive predictive value (PPV) of the SOGS as a screener for DSM-III-R PG, using a threshold value of 5, was 65%. However, due to the relatively low prevalence of PG in the general population, the SOGS considerably overestimates the prevalence of PG in community samples. Our adjusted prevalence estimate was approximately 40% lower than the SOGS prevalence estimate. This finding is in line with other studies. A meta-analysis of prevalence studies, comparing all the studies that used a two-stage methodology with the SOGS and the DSM diagnostic criteria, revealed that the number of pathological gamblers positively screened by the SOGS is approximately two times higher than obtained with the DSM criteria (Shaffer, H. J., Hall, M. N., & Vander-Bilt, J., 1999; Stinchfield, R., 2002). These findings suggest that all community studies using only the SOGS to determine the prevalence rate overestimate the true prevalence of pathological gambling.

Assessment of gambling severity: the Gambling Problems Severity Scale (GPSS)
Chapter 6 described the development of a new screening tool, the Gambling Problems Severity Scale and its sound psychometric properties fulfilling the Rasch model for both the total gambling severity continuum (total scale) and for each of the assessed domains (4 sub-scales). The results obtained in this study validated the concept of gambling as a continuum, assuming item hierarchy. The main strengths of the GPSS are: (1) its population independence, i.e. the properties of the scale do not change across populations; (2) its scores can be easily converted into interval scales; (3) the GPSS has a good discriminate validity; and finally, (4) the GPSS is a concise, clinically based self-report instrument that does not require training, which makes the questionnaire highly cost-effective.

As an assessment tool, the GPSS has several advantages over the SOGS. Apart from its sound psychometric properties, it derives its potency both from its ability to assess the severity of gambling problems relative to different life domains and from the interval nature of its scales.

In summary, the GPSS enables clinicians to tailor their treatments to individual clients, to assess the life dimensions for which help is needed most, to measure the effects of their interventions and to compare different interventions as to their ability to ameliorate consequences on severity dimensions. In addition, the GPSS can help researchers to establish whether the severity and nature of the gambling-related problems are indeed associated with the game of chance played.
STRENGTHS AND LIMITATIONS

At this point, it is important to emphasise that at all stages of this socio-epidemiological study, i.e. its preparation, execution and analyses, the utmost was tried at methodological and statistical levels, to ensure that the estimates on the addictive potential of scratchcards were as accurate as possible. Nevertheless, no study is without its limitations; these weaknesses will be addressed in this section. But first we would like to call attention to several of its strengths.

The present study is one of the largest prospective studies ever conducted to monitor the prevalence of regular, potentially problematic and pathological gambling at the community level investigating one specific game of chance, i.e. scratchcards. A large nationwide non-proportional stratified random sample (n=12,222) was used and a cost-effective two-stage design was applied. Another of the study’s strong points was its prospective nature with a follow-up period (2 years) that was long enough to detect changes in the temporal stability of pathological scratchcard-related problems and the assessment of the adverse effects of scratchcards at the community level. Additionally, in order to portray the real impact of scratchcards on the general population as accurately as possible, our figures were calculated always using the most conservative estimates and “best- and worst-case scenarios” with confidence intervals at all times. This means that if our estimates should carry any bias, such a bias would be in the direction of an overestimation of this phenomenon (conservative approach, Chapter 3).

Next, the various limitations of this study will be addressed in brief (for a more detailed description of the shortcomings we refer to their discussion in the relevant chapters). One of the main limitations concerns the exclusion criteria of our sample and its potential bias. Indeed, excluding new, non-native residents who are not fully competent in Dutch and under-age scratchcard buyers may have biased our prevalence rate. However, as explained in Chapters 2 and 3, the exclusion of respondents with an insufficient command of the Dutch language is not likely to have seriously affected the prevalence estimates since the exclusion criteria only applied to those unable to understand the questions. As to the second exclusion criterion: only if one assumes that under-age players\(^3\) are more at risk of developing PSG would the net effect have been an increase in the prevalence estimate. The exclusion of youths under the age of 18 does, however, imply that our findings only pertain to adults and cannot be generalised to minors. Additionally, because the addictive potential of a specific game of chance is also a function of the accessibility/availability of other continuous forms of gambling (i.e.: slot machines, casinos, bingo, etc.), scratchcards might be more addictive in a context where, as compared to the Netherlands, access to other games of chance is very limited. This means that caution should be used with any extrapolation of our findings to other countries. Similarly, it is important to emphasise on the danger of generalising specific results about the negative side effects of gambling across different games of chance.

The main methodological problem in the incidence phase of this study (Chapter 3) concerned the fact that only potential problematic scratchcard players and pathological

\(^3\) The gambling regulation in the Netherlands does not allow the sale of scratchcards to minors (< 18 years).
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scratchcard gamblers were followed-up. As a consequence, all incidence and prevalence estimates are dependent upon the assumptions pertaining to the incidence of PSG in occasional and recreational scratchcard gamblers. These assumptions were quite conservative and if they did bias the main findings of this paper (low prevalence, low public health risk and low incidence) they are more likely to have led to an overestimation.

Another limitation is related to the lack of evidence on the test-retest reliability of the DIS-T. Consequently, part of the alleged temporal instability may reflect unreliability instead of true changes in gambling problems. However, the fact that the SOGS total score also had low temporal stability and the fact that the GPSS yielded lower severity scores at the follow-up measurement both lend support to the true temporal instability interpretation.

Two other important issues that deserve special attention are the self-perception of gamblers and the reliability of self-reported gambling behaviours. Several studies showed great ambiguity in the self-perception of gamblers, especially concerning their participation in scratchcard gambling and lotteries (Shepherd, R. M., Ghodse, H., & London, M., 1998; Lange, M. A., 2001). Playing these two games of chance is generally not perceived as gambling by the majority of the players, unless these items were purchased frequently. However, this ambiguity is unlikely to have played a part in this study since every item in the questionnaire referred to scratchcards. As to the second issue, as mentioned in Chapter 4, self-reports based on retrospective information may be subject to distortion and underestimation of the gambling-related problems at initial assessment, particularly among those with a high recovery rate (Vitaro, F., Arseneault, L., & Tremblay, R. E., 1997). This last bias is likely to have affected our findings because most of the players in the unique PSG group experienced a recovery in the follow-up interval. Furthermore, the tentative nature of the Chapter 4 findings needs to be emphasized. It concerned an exploratory study with a retrospective design and a limited number of cases (n=10). Replication of these findings in a different gambling context and among underage populations would be useful to clarify the addictive potential of scratchcards.

RECOMMENDATIONS FOR FUTURE RESEARCH

This thesis has provided strong scientific evidence for the low addictive potential of scratchcards in the Dutch adult population. However, replication of this study in other countries, where the availability of this game is regulated differently, that would also include under-age players is required to gain a more in-depth understanding of the addictive potential of scratchcards. Further qualitative research is needed to investigate the singularity of the exceptional group of unique pathological scratchcard gamblers identified in this study. It would be most interesting to compare the careers of unique pathological scratchcard gamblers with the development of the gambling careers of other homogeneous groups of pathological gamblers (e.g. unique pathological slot-machine gamblers) and to thus provide evidence as to the specific addictive potential of these various games of chance.
Additional research is recommended in order to further investigate the relationship between the structural characteristics of different games of chance and its addictive potential. Regarding the so-called “Kingma’s risk profile”, the question has been raised whether the structural game characteristics have the same weight across the different games of chance in terms of their addictive potential and whether these characteristics can be simply applied to calculate the risk profile of any form of gambling (Kingma, S., 1993, see chapter 1, page 17). Although in the Netherlands this profile is frequently used by various key figures in the gambling field, as yet it remains to be proven that this ‘Kingma’s score’ is a valid indicator of addictive potential. The fact that scratchcards, according to this method, have a positive addictive potential, while several articles presented in this thesis prove the contrary, are indicative of certain validity problems.

To date, relatively few reports on pathological gamblers have been published that used methodologically strong designs comprising prospective designs, large random samples, standardised definitions and internationally accepted instruments (like the SOGS and structured diagnostic interview schedules to define the population of pathological gamblers under investigation), or appropriate time-frames. It is evident that these are all prerequisites for the further enhancement of the scientific quality of epidemiological research which, when met, will facilitate a more accurate assessment of the diverse variables that play a role in this disorder and its severity in future community studies.

The longitudinal character of prospective studies allows the prevalence of gambling-related problems to be assessed at different points in time and facilitates the evaluation of the incidence and the temporal stability of these problems. To assess the effects of the public availability of games of chance or specific preventive measures in the general population effectively does, however, require a follow-up interval of sufficient length. In order to reduce the costs of large prospective studies we recommend the use of a cost-effective design like the two-stage sampling procedure and the combined use of both screeners and diagnostic instruments that were employed in this thesis.

When comparing the results of the studies conducted in various countries, the variance in the reported prevalence estimates could be explained by the difference in sample characteristics, the diagnostic criteria employed and the assessment procedures used. In order to enhance the reliability and comparability of data sets about gambling-related problems across countries, we advocate the use of validated and internationally accepted assessment instruments, standard diagnostic criteria, and appropriate time-frames.

Special attention should be paid to the methodology to identify players that have gambling-related problems or are at high risk of developing such problems. The most widely used screening questionnaire in general population studies is the South Oaks Gambling Screen (SOGS, Lesieur, H. R. & Blume, S. B., 1987; Potenza, Marc N. & Chambers, R. Andrew, 2001; Shaffer, H. J., Hall, M. N., & Vander-Bilt, J., 1999; Stinchfield, R., 2002; Volberg, R. A. & Abbott, M. W., 1994). As the SOGS has been adapted and/or validated in more than twenty languages, this screening tool is recommended to help ensure that the data collected on an international scale are comparable, although this does not mean that we do not acknowledge its limitations (Dickerson, M. G., Baron, E., Hong, S.-M., & Cottrell, D., 1996;
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Cox, B. J., Kwong, J., Michaud, V., & Enns, M. W., 2000; Jacques, C., Ladouceur, R., & Ferland, F., 2000). For this reason we would strongly advise to combine the use of the SOGS with additional instruments such as the newly developed and promising GPSS or NODS (Koeter, M. W. J., DeFuentes-Merillas, L., Borsboom, D., Schippers, G. M., & Brink, W. van den, 2004; National Opinion Research Center, NORC, 1999). In addition, the DSM-IV diagnostic criteria (American Psychiatric Association, 1994) are recommended to define pathological gambling. These DSM-IV diagnostic criteria for PG (American Psychiatric Association, 1994) are generally considered the standard and have been internationally adopted as the new benchmark by researchers and treatment professionals (Stinchfield, R., 2003; National Opinion Research Center, NORC, 1999).

When both screeners and diagnostic instruments are employed, the emphasis should be shifted from a lifetime to a last-year prevalence to allow the evolution of gambling problems over time to be further explored. Lifetime prevalence appears to overestimate the problem and thus does not allow for a sensitive assessment of the gambling situation over time (Jacques, C., Ladouceur, R., & Ferland, F., 2000; Crockford, D. N. & elGuebaly, N., 1998). The strongest evidence for the efficacy of government regulations and preventive programmes targeted at gambling-related problems would be the reduction of both their point prevalence and incidence, measured within a time-frame that is sufficiently sensitive to assess any changes in gambling behaviour. By definition, lifetime prevalence cannot decrease over time.

Future studies should not solely rely on the level of symptoms or the total score on self-report screeners to determine the severity of gambling problems, but rather use properly validated instruments like the Gambling Problems Severity Scale (GPSS, Chapter 6) to assess the severity of this disorder.

Epidemiological surveys of gambling and problem gambling have become an essential component in the monitoring of legal gambling internationally (Volberg, R. A., Abbott, M. W., Ronnberg, S., & Munck, I. M. E., 2001). Hence, it cannot be stressed enough that an enhancement of the quality of the research designs would greatly contribute to a more accurate picture of gambling problems and the different factors that play a role in this disorder.

ARE SCRATCHCARDS ADDICTIVE?

During the last few decades there has been a surge in the availability of and expenditure on legalised forms of gambling, which was accompanied by a corresponding increase in public concern about the harmful impact thought to be associated with gambling. Governments and the gambling industry itself have responded by funding research targeted at both the assessment and amelioration of these assumed effects. In 1994 scratchcards were introduced in the Dutch legal gambling market. The introduction was preceded and accompanied by a

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4 The time-frame selection is not only conditioned by research purposes, but also depends on whether PG is seen as a chronic disease (with lapses and relapses) or as a disorder that can be cured. The most logical time-frame for the former will be lifetime prevalence whereas for the latter this would be last-year prevalence.
long and often heated public debate about its addictive potential. The studies presented in this thesis were conducted to shed new light on the addictive potential of scratchcard gambling.

Our findings did not corroborate the concerns voiced that preceded and accompanied the introduction of scratchcards in the Netherlands in 1994. In contrast to the assumed addictive potential of scratchcards (although estimated as moderate, according to Kingma, S., 1993), pathological scratchcard gambling (PSG) was found to be a rare phenomenon among adult scratchcard buyers in the Netherlands. Both incidence and stability of the DSM-IV diagnosis of PSG were low. The low prevalence estimate is in line with previous studies reporting that most of the scratchcard players do not experience scratchcard-related problems (IPM, 1993; Lester, 1994; Aasved, 1995; Hendriks et al., 1997). In addition, the present study clearly shows that scratchcard related problems are transient.

The public health impact of scratchcard gambling can be put into perspective by weighing it against the effects of another similarly low-prevalence phenomenon like heroin use (0.1%) and against a high-prevalence phenomenon like alcohol consumption (86%). In order to compare these three “products” the following variables need to be taken into account: (1) the number of ‘users’, (2) the addictive potential, and (3) the biopsychosocial consequences. In 1999 the penetration rate of scratchcards for the Dutch general adult population was 19%, which means that there were approximately 2,280,000 scratchcard players, from which only a small percentage (0.046%) got addicted to this game of chance. Since the severity of the addiction was generally low, the consequences of this disorder were also minor. In comparison, the prevalence of heroin use in the Netherlands was estimated at 0.1% (Nationale Drug Monitor (NDM), 2002), from which approximately 70% (27,000 people) got addicted to this substance. The consequences of heroin addiction were severe. Clearly, even though scratchcards are used more frequently, they are far less addictive and have far fewer and far less severe consequences for both the user and society at large than heroin. By contrast, the prevalence rate for alcohol use was estimated at 86% for the Dutch general population in 2002 (CBS, 2002), from which 8% (185,000 people) suffered from alcohol abuse or dependence. Although scratchcards are used far less frequently, again they are far less addictive and have far fewer and less severe consequences than alcohol. Table 7.1 summarises these comparative results.

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<th>Prevalence of users</th>
<th>Addictive potential</th>
<th>Consequences</th>
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<tbody>
<tr>
<td>Alcohol</td>
<td>Very High</td>
<td>Low</td>
<td>Severe</td>
</tr>
<tr>
<td>Heroin</td>
<td>Low</td>
<td>Very high</td>
<td>Severe</td>
</tr>
<tr>
<td>Scratchcards</td>
<td>High</td>
<td>Very Low</td>
<td>Moderate/low</td>
</tr>
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The public health impact of alcohol among Dutch adults is approximately 173 times the public health impact of scratchcards. Additionally, scratchcard-related problems are also very rare in treatment settings and when presented are always in comorbidity with other forms of gambling (e.g. slot machines or casino games) which are the main focus of treatment. It can therefore be concluded that under the current regulatory conditions, the social burden of scratchcard gambling for the Dutch adult population is quite low.
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It needs to be noted that this does not mean to say that our findings can be extrapolated to other forms of gambling or that the same regulations will be equally effective in preventing the harmful effects of other games of chance. One of the government’s responsibilities is to protect both the individuals and the community against potential addictive behaviours, while maintaining a careful balance between the individual freedoms and the collective protection. With this intention, the Dutch Gaming Law endeavours to prevent gambling-related problems (consumer protection) and at the same time keep illegal gambling under control, surely not an easy task considering that nowadays almost everybody can have access to electronic casinos at the other side of the world.

Research will continue to try and fulfil the demands for information from key audiences such as policy-makers, journalist, the gaming industry, clinicians and community groups, who are all concerned about the impact of legalised gambling and the introduction of novel forms of gambling (Volberg, R. A. & Banks, Steven M., 2002; Lesieur, H. R., 2002). Governments can and should make use of scientific knowledge as the basis for new legislation. To be eligible for funding researchers should ensure that their studies fulfil a set of minimal methodological requirements, as outlined above. Only then will they have any chance of success in unravelling the addictive potential of different gambling forms or succeed in monitoring the effects of gambling availability and the efficacy of gambling regulations aimed to promote responsible gaming at a community level. In addition, there is a clear need for more research into the effectiveness of consumer protection measures (Banks, G., 2003) and the efficacy of treatment interventions for those who fall victim to uncontrolled and pathological gambling as well as basic research into the underlying biological factors of pathological gambling in relation to other disorders associated with loss of control.

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