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

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CHAPTER 3

TEMPORAL STABILITY OF PATHOLOGICAL SCRATCHCARD GAMBLING AMONG ADULT SCRATCHCARD BUYERS TWO YEARS LATER

ABSTRACT

Aims To estimate the two-year cumulative incidence of pathological scratchcard gambling (PSG) among a representative sample of high-risk scratchcard buyers, to assess the two-year temporal stability of PSG and scratchcard-related problems, and to estimate the adjusted one-year prevalence for PSG taking into account the temporal dynamics of this diagnosis.

Design A prospective study with two assessments was applied to a non-proportional stratified random sample of 12,222 adult scratchcard buyers in the Netherlands. A cost-effective design was used and only those scratchcard buyers (n=201) who had already experienced some scratchcard-related problems at initial assessment were followed-up two-years later.

Participants Two independent cohorts of buyers with scratchcard-related problems were followed-up: a cohort of 173 potential problematic scratchcard gamblers (PPSG) at increased risk for PSG and a cohort of 28 pathological scratchcard gamblers. Incidence and prevalence estimates were calculated for the total sample of adult scratchcard buyers and for the Dutch adult population.

Findings Of the PPSG group 6.72% (95% C.I. 2.30%-8.90%) became addicted to scratchcards during the two-year period. The two-year cumulative incidence of PSG among Dutch adult scratchcard players was 0.24% (95% C.I. 0.16%-0.34%). The stability of the DSM-IV diagnosis of PSG ranged from 11.1% to 42.9%, depending whether or not those lost to follow-up were considered to be cases of PSG. Taking into account the dynamics of this disorder, using the most conservative assumption, the adjusted one-year prevalence of PSG for the total sample of adult scratchcard buyers was 0.33% (95% C.I. 0.23%-0.45%).

Conclusions PSG proves to be a rare phenomenon among adult scratchcard buyers in the Netherlands. Both incidence and prevalence of the DSM-IV diagnosis PSG were low. Stability of the DSM-IV diagnosis PSG, DSM-IV criteria and South Oaks Gambling Screening-S (SOGS-S) problems were low. Prevalence was stable over the time because incidence and the recovery rates were very similar.

INTRODUCTION

In the last two decades scratchcards, scratchies or instant lotteries have been launched in more than 40 countries across five continents. This introduction was often accompanied by a rapid expansion in sales and heated public debate about their potential negative side-effects in terms of excessive playing and pathological gambling.

Several authors related the increased availability of gambling opportunities to a rise in the prevalence of problems related to gambling (Volberg, 1994; Shaffer et al., 1999; Grun & McKeigue, 2000). However, not all hazardous games have the same addictive potential. Scratchcards are a type of gambling product that appears to have the characteristics of the more addictive forms (slot machines) and also the less addictive forms (i.e. traditional lottery) (Dickerson, 2003; DeFuentes-Merillas et al. 2003). The structural characteristics considered to increase the addictive potential of a game of chance are: (1) the pay-off schedules and event frequency of the game, (2) psychology of near miss, (3) multiplier potential, (4) win probability and payout ratio, (5) gambling advertising (name, sound, light and colour effects), (6) suspension of judgement (Griffiths, 1995; Pugh & Webley, 2000). In addition to these structural characteristics four situational features are frequently mentioned to influence the addictive potential of a game of chance: (1) location of the game and environmental characteristics, (2) availability of the game in a specific area or possible membership requirement and enforcement of the gaming laws, (3) influence of advertising in television radio etc, 4) accessibility/availability of other continuous games of gambling. Since scratchcards fulfil several of these characteristics they are considered by some to be moderately addictive and sometimes even referred to as ‘paper fruit machines’ (Griffiths, 2000). However, only limited empirical evidence supports the presumed risk of scratchcards.

In the last decade, several studies have been published on the prevalence of scratchcard-related problems among adults (IPM, 1993; Hendriks et al., 1997; Shepherd et al., 1998; Grun & McKeigue, 2000; DeFuentes-Merillas et al., 2003) and adolescents (Wood & Griffiths, 1998; Griffiths, 2000; and Pugh & Webley, 2000). Despite heterogeneity in designs, samples and the methodological limitations of these studies, the following three conclusions can be drawn: (1) most scratchcard gamblers do not experience scratchcard-related problems. (Hendriks et al., 1997 & Shepherd et al.,1998). (2) When scratchcard-related problems were reported, the prevalence was low and mainly restricted to vulnerable subgroups, especially adolescents who bought them illegally (Wood & Griffiths, 1998; Griffiths, 2000; and Pugh & Webley, 2000). (3) Two characteristics are mentioned as potential risk factors among adults: heavy involvement in other forms of gambling (IPM, 1993; Hendriks et al., 1997); and lower income and education level (Shepherd et al., 1998; Hendriks et al., 1997).

However, generalisation of these results is complicated due to methodological limitations (non representative samples, self-report data, low response rates). Consequently, the potential negative consequences of scratchcards for the adult general population are still unclear. Therefore, a new study was needed to assess the addictive potential of scratchcards. Ideally, this study should include a random sample of the general population and should be longitudinal (Wood & Griffiths, 1998; Griffiths, 2000). Such a study could explore the incidence and the prevalence of scratchcard-related problems, as well as to assess the stability of the pathological scratchcard gambling (PSG) diagnosis over the time.

This paper describes such a study. A prospective study was conducted 5 and 7 years after the introduction of scratchcards in the Netherlands. It comprised two parts: a cross-sectional prevalence study, with a large representative sample of adult scratchcard buyers, and an incidence study, with a selected sample of those scratchcard buyers who had reported some
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scratchcard-related problems in the prevalence phase. For these studies, pathological scratchcard gambling was defined as fulfilling the DSM-IV criteria for pathological gambling (this was assessed with the Diagnostic Interview Schedule—DIS-T, APA 1994). The DSM-IV criteria for pathological gambling is generally considered the current standard (Stinchfield, 2003) and it has been adopted internationally as the new standard by researchers and treatment professionals (National Opinion Research Center, NORC, 1999).

The primary objective of the prevalence study was to obtain a valid estimate of the one-year prevalence of regular, problematic, and pathological scratchcard gambling among a representative sample of Dutch adult scratchcard buyers. This prevalence study was conducted between June 1999 and the beginning of 2000. The main findings were: a) 71.61% of the 12,222 scratchcard buyers were occasional gamblers (i.e. bought \( \leq \) 10 scratchcards a month), b) 25.71% were recreational scratchcard gamblers (i.e. bought > 10 scratchcards in the month prior to the initial assessment and played scratchcards for more than six months), c) 2.44% were considered potential problematic scratchcard gamblers (PPSG; i.e. a total score \( \geq \) 3 on the South Oaks Gambling Screen (SOGS-S), and d) only 0.24%\(^2\) met the DSM-IV criteria for PSG. Of these PSGs, one-third was uniquely addicted to scratchcards whilst the remaining two-thirds were also addicted to other hazardous games. A more detailed description of the results of this prevalence phase was published elsewhere (DeFuentes-Merillas et al., 2003).

However, this prevalence study left several questions unanswered. First, it described the situation only 5 years after the introduction of scratchcards in the Netherlands. Given that it takes, on average, 3.5 years to become addicted (Meyer, 1992), it is likely that a number of persons would have yet to develop the full range and intensity of behaviour indicative of PSG. Consequently, the prevalence estimate could be biased toward the null (i.e. an underestimate). Secondly, this study did not provide any information about the temporal dynamics of the pathological scratchcard gambling diagnosis or about the stability of scratchcard-related problems as assessed by the SOGS.

To overcome these shortcomings, an incidence study with a two-year follow-up was implemented. This incidence study had three main goals: (1) to estimate the two-year cumulative incidence of pathological scratchcard gambling (PSG) among a group at-increased-risk for PSG (potential problematic scratchcard gamblers) and to estimate the incidence of PSG among all adult scratchcard buyers, (2) to assess the temporal stability of PSG and scratchcard-related problems among a group of pathological scratchcard gamblers and a group of potential problematic scratchcard players, and (3) to present an adjusted one-year prevalence estimate for PSG taking into account the temporal dynamics of this diagnosis.

\(^2\) In contrast with the prevalence study these percentages of occasional, recreational, potential problematic and pathological scratchcard gambling were considered mutually exclusive and their sum is 100%. When considering these groups as mutually inclusive (i.e. pathological scratchcard gamblers were included in potential problematic which were included in regular gamblers) the percentages will be as follows: 71.61% occasional, 28.4% regular, 2.68% potential problematic and 0.24% pathological scratchcard gamblers, as a consequence their sum exceeds 100%.
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METHODS

Design
Given the low prevalence of PSG (0.24%) and scratchcard-related problems (2.44%) among Dutch adult scratchcard buyers found in our prevalence study, following-up the total sample of 12,222 scratchcard buyers would be an extremely inefficient study design. For this reason only those buyers already experiencing a number of scratchcard-related problems at the initial assessment were followed-up. These 201 respondents comprised a cohort of 173 potential problematic scratchcard gamblers (i.e. respondents with a SOGS total score ≥ 3 and not fulfilling the DSM-IV criteria for PSG) and a cohort of 28 respondents fulfilling the DSM-IV criteria for pathological scratchcard gambling. Follow-up assessment (t2) took place two years after the initial assessment, i.e. between June 2001 and January 2002.

Sample
In the cohort of 173 potential problematic scratchcard gamblers 39 participants were lost to follow-up. The remaining 134 (77.5%) potential problematic scratchcard gamblers were mainly men (61.2%), mean age was 42.7 years, 61.9% had a low education level, 35.8% were married and the majority was Dutch (68.7%). Approximately half (51.5%) also participated in other short payout interval forms of gambling (mainly slot machines).

The cohort of 28 participants fulfilling DSM-IV criteria for pathological scratchcard gambling at t1 was followed-up to assess the stability of the diagnosis PSG. Eighteen (64.3%) of these PSG could be contacted at t2. Of these 18 participants 55.6% were women, the mean age was 41.8 years, 27.8% was married, Dutch (61.1%) and they were mainly lower educated (66.7%). 72.2% participated in other short payout interval games, 38.9% were in addition to their addiction to scratchcards also addicted to other forms of gambling (mainly slot machines).

Non-response analyses showed that loss to follow-up in the potential problematic scratchcard gamblers cohort was neither related to demographic factors nor to gambling characteristics or number of gambling-related problems at t1. In the PSG cohort however, loss to follow-up was related to number of gambling problems at t1. In order to minimise selection bias favouring low stability or low prevalence, all respondents lost to follow-up in the PSG cohort are considered a case at follow-up.

Assessment instruments and case definition
Initial and follow-up assessments comprised a combination of structured interviews and a self-report questionnaire. The South Oaks Gambling Screen (SOGS, Lesieur & Blume, 1987) is a 20-item self-report screener for pathological gambling based on the DSM-III criteria for pathological gambling. This instrument correlates well with the DSM-III-R criteria (Lesieur & Blume, 1993) and recently, the SOGS reliability, validity and classification accuracy was examined against the DSM-IV criteria (Stinchfield, 2002). In the latter study, the SOGS was found to have a satisfactory reliability and validity. The SOGS total score ranges from 0 to 20. For this study an adapted version of the SOGS was used. In this version the word “gambling”
was replaced by “scratchcard gambling” (SOGS-S) and through the refining of the questions regarding the loss of control by exclusion of an impulsive purchase as an indicator of problematic gambling. A SOGS score of 0-2 indicates no problem with gambling, 3-4 indicates possible problematic gambling and a score of 5 or more indicates probable pathological gambling. In this study a cut-off score of 3 on the SOGS-S at t₁ was used as the first condition to identify participants at-increased risk to develop PSG (potential problematic scratchcard gamblers). In accordance with several other studies (Emerson & Laundergan, 1996; Dickerson et al., 1996; Lesieur & Blume, 1993) we changed the time-frame from ‘lifetime’ to ‘last year’. This makes the SOGS both a better screener for current gambling problems and facilitates comparisons with other studies. A person is considered a potential problematic scratchcard gambler if (s)he has a SOGS-S total score ≥ 3 and is not already a pathological scratchcard gambler (i.e. not fulfilling the DSM-IV criteria).

An adapted version of the Pathological Gambling Section of the DSM-IV Diagnostic Interview Schedule (DIS-T, APA, 1994) was used, with separate questions on each item regarding scratchcard gambling and other games of chance excluding scratchcards. Onset and recency of scratchcard and other gambling problem were assessed for each individual item. An example of the scratchcard adaptation is: “has your scratchcard gambling ever caused you trouble with your partner or a family member?” Instead of the original question: “has your gambling ever caused you trouble with your partner or a family member?” A mania screener based on Section F of the DSM-IV Diagnostic Interview Schedule (DIS-F, APA, 1994) was used to exclude the presence of a manic episode.

Statistical analysis
Because potential problematic scratchcard gamblers are both a small fraction and, in terms of addiction risk, a highly selective subgroup of all scratchcard buyers, all estimates from this cohort overestimate the addictive potential of scratchcards for adult scratchcard buyers in general. By combining results of the prevalence study with results of the incidence study and making some assumptions about the incidence of PSG in occasional and recreational scratchcard gamblers an incidence estimate for all adult scratchcard gamblers was calculated. The two assumptions were: 1) incidence of PSG for occasional scratchcard gamblers is a quarter of the prevalence of PSG at t₁ (I₁ = 0.25* 0.0024 = 0.0006) and 2) the incidence of PSG for recreational scratchcard gamblers is half of the prevalence of PSG at t₁ (I₂ = 0.50*0.0024 = 0.0012). Given that the two-year cumulative incidence of PSG for potential problematic scratchcard gamblers is 6.72% (I₃), the cumulative incidence rate for the total sample can be estimated as the weighted sum of these three incidence estimates using the relative frequency of these subgroups at t₁ as weight factors. The specific assumptions with their legitimisation and the procedure followed to achieve an incidence estimate for all scratchcard buyers can be found in Appendix 3 1. Appendix 3 2 describes the calculation of the adjusted prevalence estimates for PSG taking into account the temporal dynamics of PSG. Penetration rates among the general population were used to calculate the one-year adjusted prevalence of PSG for the general Dutch adult population. The latter prevalence rates can be
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used to compare the public health impact of scratchcards with the public health impact of alcohol, tobacco or other drugs.

RESULTS

Two-year cumulative incidence of pathological scratchcard gambling (PSG)
The estimated two-year cumulative incidence of PSG for potential problematic scratchcard gamblers was 6.72% (95% confidence interval 2.30%-8.90%). Potential problematic scratchcard gambling clearly is a risk for the development of PSG. However, even in this group the overall majority (93.28%) did not become addicted to scratchcards during the two-year follow-up. Using a procedure described in the statistical analysis section and in Appendix 3.1, the two-year incidence for the total sample is estimated to be 0.24% (95% confidence interval 0.16%-0.34%).

Stability of PSG

Stability (or chronicity) of the DSM-IV diagnosis ‘pathological scratchcard gambling’ was low. Only two (11%) of the 18 people addicted to scratchcard at \( t_1 \) still fulfilled the DSM-IV criteria two years later (see Table 3.1). However dropout analyses in this group showed that loss to follow-up was related to the number of scratchcard-related problems and the amount of money spent on scratchcards and other hazard games at \( t_1 \). To adjust for potential selection bias as a ‘worst case scenario’ all persons lost to follow-up were assumed to be still addicted at \( t_2 \). This approach gives the highest stability estimate: 42.9%. This relatively low stability did not mean that those people no longer fulfilling DSM-IV criteria for PSG at \( t_2 \) did not experience scratchcard-related problems at \( t_2 \). Between 50% and 67.9% of them still had a SOGS-S total score \( \geq 3 \). These problems were however less frequent, less intense or there were just too few of them to warrant a DSM-IV diagnosis pathological scratchcard gambling.

Table 3.1 Stability of SOGS-S \( \geq 3 \) and PSG.

<table>
<thead>
<tr>
<th>SOGS-S total score ( \geq 3 )</th>
<th>DSM-IV for PSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_1 )</td>
<td>( t_2 )</td>
</tr>
<tr>
<td>PSG (18)</td>
<td>100%</td>
</tr>
<tr>
<td>PPSG (134)</td>
<td>100%</td>
</tr>
</tbody>
</table>

*This interval represents the best- and worst-case scenarios.

The same low stability is observed with scratchcard-related problems as assessed by the SOGS-S. Of the potential problematic scratchcard players at \( t_1 \) only 18.6% still had a SOGS total score \( \geq 3 \) at the follow-up assessment two years later.

Table 3.2 shows the temporal stability of scratchcard-related problems in the cohort of potential problematic scratchcard gamblers as assessed by the SOGS-S. Table 3.3 shows the symptom and non-symptom stability for each of the 10 DSM-IV criteria in the cohort pathological scratchcard gamblers. Stability of a symptom is defined as the proportion of people who did have the symptom at \( t_1 \) and still have the symptom at \( t_2 \). On the other hand,
non-symptom stability is defined as the proportion of people who did not have the symptom at \( t_1 \) and still do not have it at \( t_2 \).

### Table 3.2 Symptom and non-symptom stability of scratchcard-related problems among potential problematic scratchcard gamblers

<table>
<thead>
<tr>
<th>Item</th>
<th>Symptom Stability</th>
<th>Non-Symptom Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( t_{1+} )</td>
<td>Stable ( t_{1, t_{2+}} )</td>
</tr>
<tr>
<td>1. When lost money with scratchcard cards did go back another day to win back the money lost</td>
<td>59</td>
<td>15.3%</td>
</tr>
<tr>
<td>2. Claimed to be winning money playing scratchcards but was not really? In fact lost money?</td>
<td>41</td>
<td>7.3%</td>
</tr>
<tr>
<td>3. Felt that you have had a problem with scratchcards?</td>
<td>35</td>
<td>11.4%</td>
</tr>
<tr>
<td>4. Spent more money on scratchcards than one intended to?</td>
<td>107</td>
<td>30.8%</td>
</tr>
<tr>
<td>5. People criticised scratchcard cards playing, or told you that you have a problem with scratchcard cards? ( \text{regardless whether this is true} )</td>
<td>69</td>
<td>14.5%</td>
</tr>
<tr>
<td>6. Felt guilty about the way you play scratchcards or what happens when you play scratchcard?</td>
<td>51</td>
<td>29.4%</td>
</tr>
<tr>
<td>7. Felt you would like to stop playing scratchcards but didn't think you could?</td>
<td>58</td>
<td>20.7%</td>
</tr>
<tr>
<td>8. Hid scratchcard tickets, money for scratchcards, or other signs of scratchcard playing from your spouse, children, or other important people in your life? (^2)</td>
<td>47</td>
<td>10.6%</td>
</tr>
<tr>
<td>10. Had money arguments centred on your scratchcard playing?</td>
<td>22</td>
<td>13.6%</td>
</tr>
<tr>
<td>11. Borrowed money from someone and did not pay them back as a result of your scratchcard playing?</td>
<td>11</td>
<td>0%</td>
</tr>
<tr>
<td>12. Lost time from work (or school) due to scratchcard playing?</td>
<td>5</td>
<td>0%</td>
</tr>
<tr>
<td>13. If borrowed money to play scratchcards who or were you borrowing from?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) From household money</td>
<td>30</td>
<td>26.7%</td>
</tr>
<tr>
<td>b) From your spouse</td>
<td>16</td>
<td>0%</td>
</tr>
<tr>
<td>c) From other relatives or in-laws</td>
<td>9</td>
<td>11.1%</td>
</tr>
<tr>
<td>d) From banks, loan companies, or credit unions</td>
<td>16</td>
<td>12.5%</td>
</tr>
<tr>
<td>e) From credit cards</td>
<td>6</td>
<td>16.7%</td>
</tr>
<tr>
<td>g) From loan sharks (Shylocks)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>h) You cashed in stocks, bond, or other securities</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>i) You sold personal of family property</td>
<td>7</td>
<td>14.3%</td>
</tr>
<tr>
<td>j) You borrowed from your checking account</td>
<td>22</td>
<td>31.8%</td>
</tr>
</tbody>
</table>

\(^1\)Percentages were rounded to 1 decimal place.

\(^2\)Item 9 is excluded from this table because it refers to arguments with people about money in general.

The three most stable problems on the SOGS-S were: spent more money than intended to (item 4), felt guilty about the way you play scratchcards or what happens when you play...
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scratchcards (item 6) and borrowed money to play scratchcards from household money (item 13.a). However, for each of the SOGS-S item the percentages of recovery were higher than the percentages of symptom stability. Additionally, the larger part of non-symptom stability can be attributed to the fact that respondents reported not to have encountered the problem at both $t_1$ and $t_2$.

Table 3.3 Symptom and non-symptom stability of DSM-IV criteria among the PSG followed-up

<table>
<thead>
<tr>
<th>DSM-IV criteria</th>
<th>Symptom Stability</th>
<th>Non-Symptom Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stable $t_{1,t_2}$</td>
<td>Recovered $t_{1,t_2}$</td>
</tr>
</tbody>
</table>
| Preoccupation               | 17                | 35.3%                 | 64.7%              | 1                     | 100%                 | 0%
| Tolerance                   | 13                | 23.1%                 | 76.9%              | 5                     | 80.0%                | 20%
| Loss of control             | 15                | 20.0%                 | 80.0%              | 3                     | 33.3%                | 66.7%
| Withdrawal                  | 10                | 40.0%                 | 60.0%              | 8                     | 100%                 | 0%
| Escapism                    | 10                | 50.0%                 | 50.0%              | 8                     | 87.5%                | 12.5%
| Chasing                     | 15                | 33.3%                 | 66.7%              | 3                     | 66.7%                | 33.3%
| Lies / deception            | 15                | 33.3%                 | 66.7%              | 3                     | 100%                 | 0%
| Illegal acts                | 0                 | 0%                    | 0%                 | 18                    | 100%                 | 0%
| Family / job disruption     | 8                 | 12.5%                 | 87.5%              | 10                    | 100%                 | 0%
| Financial bailout           | 5                 | 40.0%                 | 60.0%              | 13                    | 92.3%                | 7.7%

1Percentages were rounded to 1 decimal place.

Compared to SOGS-S data, DSM-IV criteria have a higher threshold and as a consequence reflect more severe problems. Escapism was the criterion most stable between $t_1$ and $t_2$ (50%) followed by withdrawal, financial bailout (40%) and preoccupation (35.3%). Family/job disruption was the least reported symptom at $t_1$. None of the 18 pathological scratchcard gamblers reported to have committed illegal acts such as forgery, fraud, theft, or embezzlement to finance their scratchcard gambling. During the two-year follow-up interval, the prevalence of all the DSM-IV criteria substantially decreased with a recovery rate ranging from 50% to 87.5%.

Adjusted one-year prevalence estimate for PSG

An adjusted prevalence estimate was made taking into account the temporal dynamics of the diagnosis using the procedure described in Appendix 3.2. The adjusted one-year prevalence estimate was 0.24% (95% C.I.0.16%–0.34%) using the lenient assumption and 0.33% (95% C.I. 0.24%– 0.45%) using the conservative assumption. Both prevalence estimates were low. The value of the 'true' prevalence one-year prevalence will probably lie between these two estimates. This finding corroborates our cross-sectional last-year prevalence estimate at $t_1$ (0.24%) for adult scratchcard gamblers in the Netherlands (DeFuentes-Merillas et al., 2003), and shows that the prevalence of PSG is quite stable over time. This stable prevalence estimate is a result of the fact that the number of new cases was approximately the same as the number of recovered cases.

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DISCUSSION

In contrast to the supposedly moderate addictive potential of scratchcards, pathological scratchcard gambling (PSG) proves to be a rare phenomenon among adult scratchcard buyers in the Netherlands. Both incidence and stability of the DSM-IV diagnosis of PSG are 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). Even in the cohort of potential problematic scratchcard gamblers (i.e. those persons already experienced scratchcard-related problems at \(t_1\), and who were considered to be potential problematic scratchcard gamblers) only 6.7% developed PSG within the two-year follow-up period.

The stability of the diagnosis “pathological scratchcard gambling” (PSG) appeared to be low. A substantial number of respondents (16 out of 18) that were PSG at \(t_1\) did not fulfil the DSM-IV criteria for PSG any more two years later. Even when using a “worst-case scenario” approach, more than half of the PSG no longer met the DSM-IV criteria two years later. This does not mean, however, that these people no longer experience scratchcard-related problems (between 50% and 67.9% of them still had a SOGS-S total score \(\geq 3\) at \(t_2\) but the prevalence of scratchcard-related problems is much lower and probably less intense. The stability of cases according to the SOGS is also low. More than three quarters of the SOGS-S cases at \(t_1\) (81%) no longer had a SOGS-S-total score \(\geq 3\) at \(t_2\). These findings suggest that scratchcard-related problems are transient. This low stability at diagnostic and symptom level seems somewhat contradictory to the stable prevalence between \(t_1\) and \(t_2\). This study, however, clearly shows that a stable prevalence estimate does not imply a stable diagnosis. The fact that the prevalence at \(t_1\) was the same as the prevalence at \(t_2\) was due to the fact that the number of new cases in the follow-up period was almost the same as the number of recovered cases. Additionally, the incidence cases resemble the findings from the prevalence cases in terms of comorbidity of pathological scratchcard gambling with other games of change. Although both groups, “unique” and “combined” PSG\(^3\), met the DSM-IV criteria for pathological scratchcard gambling, the “combined” group scored positive in more number of SOGS-S items and DSM-IV criteria for scratchcards\(^4\) than those who were only addicted to scratchcards (“unique” PSG)\(^5\) at both \(t_1\) and \(t_2\). 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.

This study has several methodological limitations. The main methodological problem concerns the fact that only addicted and potential problematic scratchcard buyers were followed-up. As a consequence, all incidence and prevalence estimates are dependent upon

\(^3\) “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 of both PSG and pathological gambling on other games of chance.

\(^4\) Mean scores from cases at \(t_1\): SOGS-S= 7; DSM-IV=6 & Mean scores from cases at \(t_2\): SOGS-S= 16.5; DSM-IV=6.

\(^5\) Mean scores from cases at \(t_1\): SOGS-S= 5.5; DSM-IV=5.7 & Mean scores from cases at \(t_2\): SOGS-S= 10.33; DSM-IV=5.5.
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the assumptions pertaining to the incidence of pathological scratchcard gambling in occasional and recreational scratchcard gamblers. These assumptions were quite conservative and if the main findings of this article (low prevalence, low public health risk and low incidence) are biased by these assumptions they are more likely to overestimate than to underestimate (see Appendix 3.1). A second limitation is related to the lack of evidence on the test-retest reliability of the DIS-T. Consequently part of the 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 might be used in defence of a true temporal instability interpretation. Additionally because the severity of PSG seems to wane over time, inter-rate reliability might be a better indicator of the reliability than test-retest. Currently we are conducting a qualitative research with the “unique” PSG to assess the reliability of their diagnoses among different clinicians (inter-rater reliability) and to investigate whether their problems justify a DSM-IV diagnosis of PSG. A third limitation is the exclusion of under-age buyers which might bias our prevalence rate when generalising to the total Dutch population. However, we expect this bias to be limited. Adding under-age gamblers to our study will not only increase the denominator of the prevalence estimate but also the numerator. Only under the assumption that under-age players are more at risk to develop PSG would the net effect be an increase in the prevalence estimate. Exclusion of persons under 18 years of age also implies that our findings only pertain to adults and cannot be generalised to under-age gamblers (DeFuentes-Merillas et al., 2003).

When interpreting these results, national differences in gambling opportunities must be taken into account. The addiction potential of a specific game of chance is among others factors a function of the accessibility/availability of other short payout intervals forms of gambling (e.g. slot machines, casinos, bets and bingo). Scratchcards might be more addictive in a context where, compared to the Dutch situation, access to other short payout interval games is limited. Additionally, it is important to emphasise on the danger of generalising results about the dangers of gambling across all formats. As Dickerson (2003) pointed out the analysis of the key structural characteristics of games of change in combination with the related subjective and behavioural responses of regular players have the potential to reveal the psychological processes that maintain and erode control.

All estimates pertain to adult scratchcard buyers. However, since the penetration rate of scratchcard in the Dutch general adult population in 1999 was approximately 19%, the one-year prevalence of pathological scratchcard gambling for the total adult population in the Netherlands can be estimated to be approximately 0.046%. When comparing these prevalence estimates with those of smoking related disorders, alcohol dependence and substance dependence and pathological gambling to other forms of gambling (such as slot machines and casino games) scratchcards can not be considered an important issue from a public health perspective. For example, the one-year prevalence of alcohol dependence or alcohol abuse among Dutch adults between 18-64 years of age was 8% (Nationale Drug Monitor, 2002). The public health impact of alcohol among Dutch adults is approximately 173 times the public health impact of scratchcards.
REFERENCES


Dik, J.J. (1977) *Approximation of confidence bounds*, report number 77-09, Department of Mathematics, University of Amsterdam).


IPM Research en Advies (1993) *Oriënterend onderzoek naar de wijze waarop instantloterijen in enkele landen zijn ingevoerd en naar de eventuele problemen die zich hierbij hebben voorgedaan*. Rotterdam: IPM. [Research oriented to the way in which instant lotteries had been introduced in some countries and the eventually problems that may have occurred].


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APPENDIX 3 I. Assumptions for the calculation of incidence for occasional and recreational scratchcard gamblers.

In this study several assumptions were made about the two-year cumulative incidence of PSG among occasional and recreational scratchcard gamblers. These assumptions were necessary for the calculation of the cumulative incidence, because those subgroups were not followed-up. The rationale behind the assumptions can be summarised in two points: (1) the incidence of PSG will be mainly concentrated within those scratchcard gamblers that already encountered some scratchcard-related problems at t₀, and (2) the incidence among those characterised as occasional and recreational scratchcard gamblers at t₁ will be lower than the prevalence of PSG at t₁. More specifically the incidence for occasional gamblers was assumed to be a quarter of the prevalence of PSG at t₁ (0.25* 0.0024 = 0.0006) and the incidence of PSG for recreational scratchcard gamblers was assumed to be half the prevalence of PSG at t₁ (0.50*0.0024 = 0.0012).

This appendix provides the arguments for the size of the assumed incidences and shows that these assumptions are rather conservative.

At the t₁ prevalence study, from the 12,222 participants we have both SOGS and DIS-T data for 258 respondents (201 with a SOGS total score ≥ 3 and 58 with a SOGS total score ≤ 2, DeFuentes-Merillas, et al., 2003). Using logistic regression the relation between DSM-IV PSG and SOGS-total score at t₁ was estimated to be:

\[
\text{Logit} (\text{PSG+|SOGS=x}) = \beta_0 + \beta_1 \text{SOGS} \text{ with } \beta_0 = -3.222 \text{ and } \beta_1 = 0.231
\]

These 258 respondents, however, comprised a selected high prevalence subsample of the total t₁ sample. In order to generalise this relation to the total t₁ sample, the \(\beta_0\) parameter had to be adjusted (\(\beta_1\) is unbiased) using the following formula \(\beta_0 \text{ adj} = \beta_0 + \ln[P/(1-P)] - \ln[p/(1-p)]\) with \(P = \text{prevalence in total sample and p = prevalence in the subsample in which the logistic regression estimates were made. In our case 28 of the 258 respondents were PSG+ (p=0.1081), the prevalence in the total sample of 12,222 respondents was 0.0024. Using these figures } \beta_0 \text{ adj} = -7.142.

When \text{logit} (\text{PSG+|SOGS=x}) = -7.142+0.231x \text{ the prevalence of PSG+ among occasional and recreational scratchcard gamblers can be estimated using the logistic relation between P(PSG+) and SOGS-total score P(PSG+|SOGS=x) = 1 / [1-exp(-7.142+0.231x)]}

P(PSG+| SOGS=0) = 1/ [1+ e ^((-7.142 + 0.231 x 0))] = 0.00079.
P(PSG+| SOGS=1) = 1/ [1+ e ^((-7.142 + 0.231 x 1))] = 0.0010.
P(PSG+| SOGS=2) = 1/ [1+ e ^((-7.142 + 0.231 x 2))] = 0.0012.
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All occasional scratchcard gamblers had a SOGS total score of '0'. The distribution of the SOGS total score in the recreational gamblers was as follows: '0'=57.7%; '1' = 30.7%; and '2'= 11.6%

Combining P(PSG+|SOGS=x) and relative frequency of SOGS total score among occasional and recreational scratchcard gamblers the prevalence at t₁ of PSG+ can be estimated as using

\[ \sum f_i p_i \]

with \( f_i = \) relative frequency SOGS total score 'i' and \( p_i = P(PSG+|SOGS='i') \). The prevalence of the potential problematic scratchcard gamblers (SOGS3+) was established empirically (28/201)

<table>
<thead>
<tr>
<th></th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasional</td>
<td>0.00079</td>
</tr>
<tr>
<td>Recreational</td>
<td>0.00090</td>
</tr>
<tr>
<td>PPSG</td>
<td>0.13930</td>
</tr>
</tbody>
</table>

RR PPSG compared to occasional = 176; RR PPSG compared to recreational = 155

The only assumption we were making to legitimate our incidence assumptions is that the ratio between the prevalences (i.e. the RR’s) at t₁ is approximately the same as the ratio between the cumulative incidences at t₂. Making this assumption and considering the fact that:

\[ CI_{PPSG} = 0.0672; \]
\[ CI_{occasional} : CI_{PPSG} = 176 = 0.00038, \text{ and} \]
\[ CI_{recreational} : CI_{PPSG} = 155 = 0.00043. \]

These calculations indicate that the assumptions made in this paper \( CI_{occasional} = 0.25^* \) prevalence t₁ and \( CI_{recreational} = 0.5^* \) prevalence t₁ (respectively 0.0006 and 0.0012) are somewhat conservative.
APPENDIX 3 II. Procedure to adjust prevalence estimates taking into account stability of
the diagnosis over time.

Although only respondents with a SOGS total score ≥ 3 were followed-up at t₂, the
prevalence of pathological scratchcard gambling at t₂ could be estimated based on some
assumptions. This appendix describes the procedure and assumptions made in order to
achieve these adjustment prevalence estimates.

Table A.1 Estimates prevalence study (n=12,222)

| X                  | P(X|buyer) |
|--------------------|-----------|
| R+                 | 0.2840    |
| R-                 | 0.7160    |
| S+                 | 0.0268    |
| S-                 | 0.9732    |
| C+                 | 0.0024    |
| C-                 | 0.9876    |

1) Probabilities were taken from prevalence report (probabilities are adjusted for sampling design).
All probabilities pertain to scratchcards buyers (DeFuentes-Merillas et al., 2003).
2) S+ comprises both PPSG (2.44% = 0.0244) and PSG (0.24% = 0.0024)

Estimating transition probabilities.

For the incidence study we divided the 201 S₁₁+ responders into two different groups.
The initial cases, which comprised the 28 respondents that fulfilled the DSM-IV criteria for
pathological scratchcard gambler at t₁ and the potential problematic scratchcard gamblers
comprising the 162 respondent which at t₁ were experiencing scratchcard-related problems,
but did not fulfil the criteria for pathological scratchcard gambling. At follow-up two years
later we were able to interview 18 of the 28 initial cases and 134 of the 173 PPSG.

Based on these data, transition probabilities were estimated as follows: A = P(case₂₊|case₁₊);
C = P(case₂₊|case₁₋) and their complements B and D (Table 3.2).

Table A.2 Transition matrix addiction probabilities t₁t₂

<table>
<thead>
<tr>
<th></th>
<th>t₂ case +</th>
<th>Case -</th>
</tr>
</thead>
<tbody>
<tr>
<td>t₁ case +</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>case -</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

Cell A
Of the 18 case₁₊ interviewed at t₂ only 2 fulfilled the DSM-IV criteria for pathological
scratchcard gambling 2 years later. Making the conservative assumption that all 10 t₁ cases
that refused to participate in the t₂ interview are still PSG:
P(case₂₊|case₁₊)= 12/28=0.4286 = A.

Cell B
B = (1 - A) or (1 - 0.4286) = 0.5714
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Cell C
This cell is a combination of case\textsubscript{1\textsuperscript{1}}- people that were S+ at \(t_1\) and case\textsubscript{1\textsuperscript{1}}- people that were S- at \(t_1\).

\textit{Case\textsubscript{1\textsuperscript{1}} - and S\textsubscript{1\textsuperscript{1}} + people (= PPSG)}
6 of the 134 (S\textsubscript{1\textsuperscript{1}}+ and case\textsubscript{1\textsuperscript{1}}-) fulfilled the DSM-IV criteria for pathological gambling adapted for scratchcards at \(t_2 = 0.045\). Assuming non-differential loss to follow-up, this is an approximation of \(P(\text{case}_{2\textsuperscript{1}+} | \text{case}_{1\textsuperscript{1}-} \text{ and } S_{1\textsuperscript{1}+})\).

\textit{C\textsubscript{1\textsuperscript{1}}- and S\textsubscript{1\textsuperscript{1}}- people}
This subgroup comprises 8,664 persons, comprising 5,893 (R- and S-) people (68 % = 0.68) and the 2,771 (R+ and S-) people (32 % = 0.32). Although we do not have follow-up data for these persons, we can approximate the probability that they will develop pathological scratchcard gambling. Given the fact that for diseases like addiction the incidence in general is much lower than the prevalence, we can make a range of probability estimates making more and less conservative assumptions.

Two assumptions need to be made, one for the occasional scratchcards gamblers at \(t_1\) \(P(\text{case}_{2\textsuperscript{1}+} | R_{1\textsuperscript{-}})\) and one for the recreational scratchcard gamblers at \(t_1\) \(P(\text{case}_{2\textsuperscript{1}+} | R+ \text{ and } S-)\). In the more optimistic estimates we assumed \(P(\text{case}_{2\textsuperscript{1}+} | R_{1\textsuperscript{-}}) = 0\). As a more pessimistic estimate we assumed \(P(\text{case}_{2\textsuperscript{1}+} | S_{1\textsuperscript{-}})\) to be 0.50 times the prevalence estimate at \(t_1\). Combining assumptions for \(P(\text{case}_{2\textsuperscript{1}+} | R_{1\textsuperscript{-}})\) and \(P(\text{case}_{2\textsuperscript{1}+} | S_{1\textsuperscript{-}})\) results in two estimates for \(P(\text{case}_{2\textsuperscript{1}+} | \text{case}_{1\textsuperscript{1}-} \text{ and } S_{1\textsuperscript{-}})\).

\textbf{Optimistic estimate}
- \(P(\text{case}_{2\textsuperscript{1}+} | R_{1\textsuperscript{-}}) = 0\)
Incidence of pathological scratchcard playing in the \(t_1t_2\) interval for occasional scratchcard gamblers = 0.
- \(P(\text{case}_{2\textsuperscript{1}+} | S_{1\textsuperscript{-}}) \leq 0.25 \times P(\text{case}_{1\textsuperscript{1}+}) = 0.25 \times 0.0024 = 0.0006\)
Incidence of pathological scratchcard playing in the \(t_1t_2\) interval for recreational scratchcard gamblers was less or equal to 0.25 times the prevalence of pathological scratchcard playing at \(t_1\).
These assumptions lead to the following estimate for \(P(\text{case}_{2\textsuperscript{1}+} | \text{case}_{1\textsuperscript{1}-} \text{ and } S_{1\textsuperscript{-}})\): 0.68\(\times 0 + 0.32 \times 0.0006^6 = 0.000192\)

\textbf{Pessimistic estimate}
- \(P(\text{case}_{2\textsuperscript{1}+} | R_{1\textsuperscript{-}}) = P(\text{case}_{2\textsuperscript{1}+} | R+ \text{ and SOGS}_{1\textsuperscript{1}} \text{ total score } < 3) \leq 0.50 \times P(\text{case}_{1\textsuperscript{1}+})\)
Incidence of pathological scratchcard playing in the \(t_1t_2\) interval for occasional scratchcard gamblers was the same as the incidence of pathological scratchcard playing in the \(t_1t_2\) interval.

\[^6 P(\text{case}_{1\textsuperscript{1}+}) \times 0.25 = 0.0024 \times 0.25 = 0.0006\]

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for recreational scratchcard gamblers and was less or equal to half the prevalence of pathological scratchcard playing at \( t_1 \).
These assumptions lead to the following estimate for \( P(\text{case}_{i2+}|\text{case}_{i1-} \text{ and } S_{i1-}) \): 0.68*0.0012 + 0.32*0.0012 = 0.0012.

Estimate for cell C\(^7\)
\[
P(\text{case}_{i2+}|\text{case}_{i1-}) = P(S_{i1+} \text{ and case}_{i1-})*P(\text{case}_{i2+}|\text{case}_{i1-} \text{ and } S_{i1+}) + P(S_{i1-} \text{ and case}_{i1-})*P(\text{case}_{i2+}|\text{case}_{i1-} \text{ and } S_{i1-})
\]

| \( P(\text{case}_{i2+}|\text{case}_{i1-}) \) |
|-----------------|
| Optimistic      | 0.0013 |
| Most conservative| 0.0023 |

Cell D
\( D = (1-C) \)
Filling in the cell probabilities in the transition matrix gives several transition matrices conditional on \( \text{case}_{i1} \) (i.e. row probabilities sum to 1.00)

**Transition matrices: conditional on DSM-IV\(_{t1}\)**

**Transition matrix addiction probabilities \( t_1t_2 \) conditional on \( t_1 \) optimistic**

<table>
<thead>
<tr>
<th></th>
<th>( t_2 )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>case+</td>
<td>case-</td>
</tr>
<tr>
<td>( t_1 ) case+</td>
<td>.4286</td>
<td>.5714</td>
</tr>
<tr>
<td>case-</td>
<td>.0013</td>
<td>.9987</td>
</tr>
</tbody>
</table>

**Transition matrix addiction probabilities \( t_1t_2 \) conditional on \( t_1 \) conservative**

<table>
<thead>
<tr>
<th></th>
<th>( t_2 )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>case+</td>
<td>case-</td>
</tr>
<tr>
<td>( t_1 ) case+</td>
<td>.4286</td>
<td>.5714</td>
</tr>
<tr>
<td>case-</td>
<td>.0023</td>
<td>.9977</td>
</tr>
</tbody>
</table>

**Unconditional transition matrices**

Multiplying the conditional probabilities by the \( t_1 \) probabilities gives unconditional cell probabilities:
\[
P(A) = P(\text{case}_{i2+}|\text{case}_{i1+})*P(\text{case}_{i1+}); \quad P(B) = [1-P(\text{case}_{i2+}|\text{case}_{i1+})]*P(\text{case}_{i1+});
\]
\[
P(C) = P(\text{case}_{i2+}|\text{case}_{i1-})*P(\text{case}_{i1-}); \quad P(D) = [1-P(\text{case}_{i2+}|\text{case}_{i1-})]*P(\text{case}_{i1-})
\]

**Transition matrix addiction probabilities \( t_1t_2 \), optimistic**

<table>
<thead>
<tr>
<th></th>
<th>( t_2 )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>case+</td>
<td>case-</td>
</tr>
<tr>
<td>( t_1 ) case+</td>
<td>.00010</td>
<td>.00014</td>
</tr>
<tr>
<td>case-</td>
<td>.0013</td>
<td>.9963</td>
</tr>
</tbody>
</table>

\(^7\) Example optimistic estimate 0.0013 = 0.0244*0.045+0.9732*0.000192
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Transition matrix addiction probabilities t1,t2: conservative

<table>
<thead>
<tr>
<th></th>
<th>case +</th>
<th>case -</th>
</tr>
</thead>
<tbody>
<tr>
<td>t1</td>
<td>0.0010</td>
<td>0.0014</td>
</tr>
<tr>
<td>case +</td>
<td>0.0023</td>
<td>0.9853</td>
</tr>
</tbody>
</table>

Estimates based on the 12,222 sample.
Prevalence estimate based on prevalence and incidence data. Prevalence at t2 was a combination of pathological scratchcard gamblers at t1 still addicted at t2 + recreational and occasional scratchcard gamblers at t1 that became addicted in the t1,t2 interval.

<table>
<thead>
<tr>
<th></th>
<th>P(case_{t2}+)</th>
<th>95 % CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimistic</td>
<td>0.0023</td>
<td>0.0015 - 0.0033</td>
</tr>
<tr>
<td>Conservative</td>
<td>0.0033</td>
<td>0.0023 - 0.0045</td>
</tr>
</tbody>
</table>

\( P(case_{t2}+) \) was calculated by adding the column of t2 case + at the different transition matrix (i.e. Optimistic \( P(case_{t2}+) = 0.0010 + 0.0014 = 0.0024 \)).

The 95% confidence interval was calculated using the estimation formula by Dik (1977). Lower bound \( \sqrt{z-.98} \); upper bound \( \sqrt{z+1+.98} \) with \( z \) = number of pathological gamblers at t2. This number was estimates by \( P(case_{t2}+) \times 12,222 \). Upper and lower bound were converted to proportions by dividing by 12,222. (example optimistic estimate: \( z=0.0023 \times 12,222 = 28 \), \( z_{lower} = 18.6 \), \( z_{upper} = 40.5 \) Transforming to proportions gives respectively 18.6/12,222 = 0.0016 and 40.5/12,222 = 0.0033.)