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Limited cash flow on slot machines: Effects on adolescent gambling behaviour

Marianne Hansen

Norwegian Institute for Alcohol and Drug Research, Oslo

&

Ingeborg Rossow

Norwegian Institute for Alcohol and Drug Research, Oslo

Correspondence to:

Marianne Hansen

Norwegian Institute for Alcohol and Drug Research

POB 565 Sentrum, 0105 Oslo, Norway

E-mail: mh@sirus.no

Phone +47 2234 0420

Fax: +47 2234 0401

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Abstract

This study addresses the impact of prohibition of note acceptors on gambling behaviour and gambling problems among Norwegian adolescents.

Data comprised school surveys at three time points; 2004 and 2005 (before intervention) and 2006 (after intervention). Net samples comprised 20.000 students at each data collection. The respondents were 13-19 year old students (8^{th} – 13^{th} grade). Two screening measures were used; the SOGS-RA and the Lie/Bet Questionnaire. Annual gambling frequency and expenditures on slot machines were examined.

Prior to the intervention, levels of problem gambling, gambling frequency and expenditures were stable, whereas a substantial decrease in these measures of gambling behaviour and problem gambling was observed after the note acceptors were removed in 2006.

The stability in gambling behaviour prior to the intervention as well as lack of any other significant changes in the gambling market, suggest that these findings can be attributed to the removal of the note acceptors on slot machines.

Keywords: Adolescent gambling; problem gambling; prevention; prevalence, note acceptors

Introduction

Gambling on slot machines has been characterized as one of the most addictive forms of gambling (Echeburua & Fernandez-Montalvo 1996; Griffiths, 1995; Turner & Horbay, 2004). In the past decade we have seen an expansion of this form of gambling in all countries that allow gambling, and slot machines often represent the main gambling activity among available gambling devices (Australian Productivity Commission, 1999; Norwegian Gaming Authority, 2006; Williams & Wood, 2004). Slot machines have been described as the "crack-cocaine" of gambling because of the assumed addictive features; short time between stake and payout or loss, rapid event frequency, reinforcing sounds and colours and the risk for loss of control over spendings (Dowling, Smith & Thomas, 2005).

It has been argued that adolescents are especially vulnerable regarding the negative consequences of gambling; 'Addictive features' and easy access makes gambling easy to start and more difficult to end (Derevensky & Gupta, 2004; Griffiths, 1993, 1995; Hardoon & Derevensky, 2002). Adolescence is a vulnerable period from both a cognitive and neurological perspective; the adolescent brain is immature and neurological structures underlying the more complex and reflective cognitions of importance for self-regulation, are not fully developed until the early twenties (Chambers, Taylor & Potenza, 2003; Metcalfe & Mischell, 1999; Mischell & Ayduk, 2004). Moreover, adolescence is a period associated with experimentation and novelty seeking; in many countries, the current youth generation grows up in a society where gambling is – more or less - allowed, accepted and available. In line with a notion of increased susceptibility among young people, it is generally found that the prevalence of problem gambling among youths is 2 – 4 times higher compared to adults (Gupta & Derevensky, 1998; Shaffer & Hall, 1996, 2001; Shaffer, Hall & VanderBilt, 1999). Consequently, the expansion of gambling both nationally and internationally, is a matter of concern, and particularly so with respect to young people (Moodie & Hastings, 2008).

What may serve as effective strategies to curb the negative consequences of slot machine gambling is much debated but still unresolved. However, various ways of regulating the gambling market, and particularly so restrictions on availability of gambling, are among the strategies that may have the potential to reduce the extent of excessive gambling and gambling problems (Blaszczynski, Sharpe & Walker, 2001) The evidence for such an assumption lies first and foremost in studies that have demonstrated that overall amount of gambling and prevalence of gambling problems have increased subsequent to changes in the gambling market that have implied increased availability (see for instance Grun & McKeigue, 2000; Room, Turner & Ialomiteanu, 1999; Turner, Ialomiteanu & Room, 1999). Whether there is a symmetry in the availability and problem prevalence association is, however, not clear; hence it is so far not obvious that a decrease in availability (for instance due to public policy regulations of the gambling market) actually will result in a decrease in the prevalence of problem gambling.

In Norway, slot machines have been the most dominant game, both among adults and adolescents (Hansen & Rossow, 2008; Lund & Nordlund, 2002; Rossow & Hansen, 2003). Slot machines have been easily available in grocery stores and shopping centres. The minimum legal age for slot machine gambling is18 years, however, the enforcement of the age limit has been close to neglible. Survey studies (Lund & Nordlund, 2002; Rossow & Hansen, 2003) as well as data from a gambling help-line in Norway have also shown that slot machines constitute the dominant game and major problem among problem gamblers.

In 2003 the Norwegian government made a resolution to prohibit all existing slot machines and establish a state monopoly of slot machines with the purpose to both ensure revenue to idealistic purposes and to prevent and reduce gambling related harm. The Norwegian state was prosecuted by the gambling industry, both in the Norwegian court system and in the EFTA court. The legal decision in this case was not made until March 2007,

were the court upheld the Norwegian state's claim. Meanwhile it was decided to prohibit bank note acceptors in order to curb an increasing turnover on slot machines. By July 1st 2006 bank note acceptor on all slot-machines in Norway had been removed and the highest stake had been reduced from notes equivalent to 25 Euros to coins equivalent to 2.5 Euro. The turnover dropped with more than 40 % after the intervention and this downswing kept stable until the slot machines were removed one year later (Norwegian Gaming Authority, 2006; 2007).

There is, as noted, very little – if any – evidence of the effectiveness of this kind of market regulation on the prevalence of problem gambling. Yet, some studies on bank note acceptors on slot machines and excessive and problem gambling are relevant here.

Australian surveys has shown that problem gamblers preferred to use bank note acceptors while gambling (Australian Productivity Commission, 1999), and also a strong relationship between regular and problem gambling and frequent use of note acceptors (McMillen, Marshall & Murphy, 2004). Furthermore, one study has shown a change in gambling behaviour among at-risk and problem gamblers by reducing the bank note denomination (Brodie, Honeyfield & Whitehead, 2003). Other studies did not support such an effect (Blaszczynski et al., 2001; Sharpe, Walker, Coughlan, Enersen & Blaszczynski, 2005). Despite this, a study from North America showed that players rated the bill acceptor as more effective (31%) than the majority of responsible gambling features in assisting them to moderate their expenditure (White, Mun & Kauffman, Whelan, Regan et al., 2006).

Although of relevance, these studies have, for various reasons, limited transfer value with respect to possible effects of prohibition of bank note acceptors on the extent of excessive gambling and problem gambling. First, these studies have addressed the potential impact of changing *the size* of bank note denominations rather than prohibition of bank note acceptors, and second, the samples which these studies are based on are with few exceptions collected from certain gambling populations.

The aim of the present study was therefore to assess whether the regulation of the Norwegian slot machine market in terms of the prohibition of the bank note acceptors on slot machines had any impact on youth gambling. More specifically we have assessed whether gambling frequency, gambling expenditures and problem gambling among young people have decreased in response to the prohibition of the bank note acceptors on slot machines.

Data and methods

Design and samples

No changes occurred in the slot machine market in Norway from 2004 to 2005. By the end of June 2006 all bank note acceptors were removed on all slot machines. The present study is based on data from Norwegian school surveys conducted in the same municipalities and schools at three time points; in 2004, 2005 and 2006. The school surveys were conducted in October/November each year as a joint data collection for two different evaluation projects; partly to assess possible effects of alcohol and drug prevention strategies at the local level and partly to assess possible effects of national efforts on regulating the slot machine market. Thus, there were two school surveys conducted prior to the removal of bank note acceptors and one school survey conducted approximately four months after the removal of bank note acceptors. As it is quite possible that other factors than regulations of the slot machine market could contribute to changes in gambling behaviour and prevalence of problem gambling and no control group for the national intervention could be established, data from the first of the two years prior to intervention (2004 data) served as control for possible trends in gambling behaviour and prevalence of problem gambling due to other factors.

The target population in all three surveys were all students in grades 8 through 13 in altogether 16 municipalities in Norway. Net samples comprised 20,703 students in 2004 (pre-intervention); 21,295 in 2005 (pre-intervention); and 20,695 in 2006 (post-intervention), and

the response rates were 82.7% (2004), 86.7% (2005) and 85.7% (2006), respectively. The respondents were mainly 13 – 19 years old, average age was 15 years and 50% were girls. Table 1 presents a summary of the demographic data. The questionnaire was completed at school and parental consent was obtained from those under 18 years. More information about procedures and data collection is described in detail in Pape, Storvoll & Rossow (2007).

Table 1 about here

Variables

At all three data collection waves identical questions on gambling behaviour were included in the questionnaire; frequency of gambling on various games in the preceding 12 months; expenditures on slot machine gambling in the preceding week and maximum bet on gambling. Additional questions were included in 2006 (post-intervention); whether they thought the removal of bank note acceptors had been noticed, whether they gambled more or less on slot machines after the removal of bank note acceptors, and if so, whether this change in gambling on slot machines was due to the intervention. The response categories on gambling frequency ranged from 'several times a week' to 'not gambled last year'. A mid-point value for each category was applied and frequency variables were transformed into semi-continuous variables on number of times gambled last year. Then, a sum score on number of times gambled last year on all games and slot machines was constructed. The students were also asked open ended questions about total expenditures on slot machines during the last week.

Two screening measures were used at all three data collections; the Lie/Bet Questionnaire (Johnson, Hamer, Nora, 1988; Johnson, Hamer, Nora & Tan, 1997) and the

SOGS-RA (Winters, Stinchfield & Fulkerson, 1993). The Lie/Bet Questionnaire is assumed to have high sensitivity (.99) and specificity (.91) (Johnson et al., 1988; Johnson et al., 1997) and to be applicable for adolescents (Götestam, Johansson, Wenzel & Simonsen, 2004; Rossow & Molde, 2006). The Lie/Bet score ranges from 0 to 2, and a score of 1+ as well as a score of 2 are used to categorize at-risk gamblers. The SOGS-RA is a 12 item gambling screen adapted from the adult version of SOGS-R (Lesieur & Blume, 1987) for use with adolescents, and is found to reliable discriminate between those who gamble regularly and not (Winters et al., 1993), and that past year gambling expenditures and gambling frequency is associated with an increasing SOGS-RA (Poulin, 2000, 2002). The SOGS-RA score ranges from 0 to 12, and a score of 4+ is used to categorize problem gamblers, whereas the corresponding scores for at-risk gamblers are 2-3, while no-problem gamblers are in the 0-1 score category (Winters, Stinchfield & Kim, 1995). These categories were also used in the present study.

Statistical analyses

Pairwise comparisons of prevalence rates between the two years prior to the intervention (2004 and 2005) and between the two years covering before and after the intervention (2005 and 2006) were tested by Chi square statistics. Corresponding comparisons of continuous variables were tested by analysis of variance (ANOVA) and F-tests.

In order to control for possible trends in gambling behaviour and problem gambling due to other factors than the intervention (as well as small differences in age and gender distributions in the three data sets) multivariate regression models were estimated. In analyses of a possible impact on prevalence rates (e.g. no expenditures on slot machines last week and problem gambling (SOGS-RA 4+)) logistic regression models were estimated, controlling for age, gender and trend from 2004 to 2005. Correspondingly, in analyses of continuous variables

(e.g. gambling frequency on slot machines and expenditures on slot machines) linear regression models were estimated, again controlling for age, gender and trend from 2004 to 2005.

Results

Compared to 2005, gambling behaviour, expenditures on slot machines as well as overall gambling frequency, showed a substantial decrease after the intervention. During the two year period prior to the intervention, the level of gambling behaviour was more or less stable.

Multivariate analysis, controlling for age, gender and possible trends from 2004 to 2005, revealed significantly less gambling behaviour after the intervention. The adolescents were 26 % less likely to gamble on slot machines after the intervention (OR= 0.74; p<.001); 50 % more likely not to have gambled at all on slot machines last week (OR= 1.50; p<.001) and 37 % less likely to be an excessive gambler (OR= 0.63; p<.001) after the bank note acceptors were prohibited and removed (Table 2).

Table 2 about here

All indicators of problem gambling showed a significant decrease from 2005 to 2006; i.e. before and after removal of bank note acceptors. However, in the period with no changes in the gambling market (2004-2005), some changes were also observed with respect to at-risk and problem gamblers (SOGS-RA 2-3 and 4+), although in opposite directions. Prevalence of problem gambling (SOGS 4+) increased from 2004 to 2005, while at-risk gambling (SOGS 2-3) decreased in the same period. There was no change in the prevalence of problem gambling from 2004 to 2005 (non-intervention period) when The Lie/Bet Questionnaire was applied as

indicator. Multivariate logistic regression models controlling for age, gender and the change from 2004 to 2005 estimated the associations between the intervention and the four indicators of problem gambling, and the odds ratios varied between 0.71 and 0.83, implying a decrease in the prevalence of problem gambling. For instance, the prevalence of at-risk gamblers (SOGS 2-3) and problem gamblers (SOGS 4+) was 29 % (OR=0.71; p<.001) and 20 % (OR=0.80; p<.001) lower after the removal of the bank note acceptors (Table 3).

Table 3 about here

Although it is generally found that boys gamble more often; spend more money on gambling and more often report gambling related problems, as compared to girls (Derevensky & Gupta, 2004; Hansen & Rossow, 2008), we did not find any significant gender (or age) differences in the reduction of gambling behaviour and prevalence of problem gambling from 2005 to 2006 (before and after the removal of bank note acceptors).

Table 4 about here

One third of the adolescents who had gambled last year reported to have noticed the removal of the bank note acceptors, and 2/3 had either stopped gambling or gambled less frequently than they did before the intervention. Still, only a small fraction of the adolescents related the changes in their gambling behaviour to the removal of the bank note acceptors.

Discussion

This study has examined a possible impact of removal of all bank note acceptors on slot machines on gambling behaviour and gambling problems among Norwegian adolescents. Gambling frequency, gambling expenditures and problem gambling among young people from 13 to 19 year decreased significantly in the time period prior to and after the removal of bank note acceptors. The decrease in problem gambling was obvious both for 'At-risk gamblers' as well as 'Problem gamblers', and the proportion of excessive gamblers – those who gambled for more than 125 euro per week – was reduced by 50 percent from 2004 to 2006. The decrease was generally of the same magnitude for both boys and girls, as for different age groups, but boys gambled more often, spent more money on gambling and had more gambling related problems.

This is the first study where the effect of removing bank note acceptors from slot machines has been evaluated. To prohibit and remove all bank note acceptors on all slot machines is a radical intervention not carried out in any other country previously. This gives a unique opportunity to evaluate the effects of a more radical and public health directed intervention. This is also the first study evaluating adolescent gambling behaviour related to removal of bank note acceptors.

Previous research has evaluated the effect of reducing the bank note denomination allowed on slot machines. Direct comparison to previous research on bank note acceptors is not feasible but a comparison is still relevant because it can give an indication on the effect of making gambling more inconvenient. Research in this field has so far indicated diverse results and has – with few exceptions – been carried out in certain populations of gamblers. However, a general finding of these studies was that a reduction of the bank note denomination influenced the expenditure on slot machine gambling in a downward direction (Australian Productivity Commission, 1999; Blaszczynski et al., 2001; Brodie et al., 2003;

Sharpe et al. 2005), ‘At-risk’ and ‘Problem gamblers’ had a decrease in gambling related problems and excessive gamblers decreased their spending to a greater degree compared to other gamblers (Brodie et al., 2003). In this respect our findings are in line with previous research and point in the direction that restrictions related to bank note acceptors curb down gambling expenditure and gambling related problems.

It has been stated that coinless machines can speed up playing time with 15 % (Palmeri, 2003). It may seem that the absence of bank note acceptors makes rapid and continuous gambling sessions less likely to occur because the slot machine gamblers have to break up the gambling sessions to exchange bank notes into coins. It is possible that such breaks facilitate considerations on whether gambling should be continued or not and thereby contribute to a less continuous play.

It is possible that interruptions in the gambling sessions can be a trigger to increased consciousness and self-regulation. Mischels & Ayduk (2004) differentiated between two types of cognitive processing; A “cool system” that is slower and more cognitively complex generating more rational, reflective and strategic behaviour, and a “hot system” that enables quick and emotional processing. The hot system is essentially an automatic system, governed by virtually reflective stimulus-response reactions, consisting of relatively few representations. People with gambling problems often describe their slot machine gambling as an automatized kind of behaviour. An interruption in the game can contribute to a “cool down” period and the gamblers opportunity to make a new choice on whether to continue the gambling or not, is strengthened. During gambling, losses and chasing the losses are often associated with stress. According to Metcalfe & Mischels (1999) an increased stress level results in an increasingly dysfunctional “cool system”, leaving the “hot system” to dominate processing. In a gambling context, the need for exchange into coins can result in a change from “hot state” to “cool state”, resulting in a more rationally and less emotionally driven

cognition which makes it less demanding to break off the gambling session. Because adolescent neurodevelopment occurs in brain regions associated with impulsivity and addiction, adolescent novelty seeking can partly be explained by immature brain development (Chambers et al., 2003). Therefore an understanding of how self-regulation among young gamblers can be facilitated is of high relevance.

No other interventions in the gambling market occurred concurrent with the prohibition of bank note acceptors during the data collection period. However, it appears that there has been a change in the norm climate in the Norwegian society. This has been expressed in several ways; firstly by an increased focus and concern by clinicians, relatives to gamblers and pathological gamblers and secondly actions taken by politicians to curb the negative consequences of slot machine gambling. It is reasonable to believe that the general consciousness among most people has increased as a consequence of a change in the norm climate and that the attitudes toward slot machine gambling has turned more negative as a consequence of negatively loaded media focus. If so, it is possible that the effect of the intervention has been reinforced and that gambling on slot machines has become less socially acceptable during this period. On the other hand, even if this study displayed some changes in gambling behaviour, we also found an increase in problem gambling from 2004 to 2005, despite an alleged change in norm climate. However, it was *after* the intervention with the bank note acceptors the major changes both in gambling frequency and expenditure – and problem gambling behaviour was evident.

According to Ladouceur, Jaques, Sévigny & Cantinotti (2005), a public health policy concerning slot machines requires measures that maximise the protection of slot machine players against excessive gambling. The present study does suggest that removing bank note acceptors contributes in the direction of an applied public policy intervention. A few previous studies have suggested that a total consumption model of gambling seems applicable as there

appears to be a clear positive association between overall amount of gambling (total consumption) and prevalence of problem gambling (Hansen & Rossow, 2008; Lund, 2008). The findings of the present study give further support to a total consumption model of gambling as we observed a decrease in the prevalence of problem gambling concurrent with a decrease in gambling frequency and expenditures after the intervention.

Some study limitations and strengths should be mentioned. There is a relatively short time span from the intervention to the data collection at T3. Four months is a short period to evaluate changes and it is reasonable to ask how much change can be expected in four months. Further, we only have cross-sectional data and thus we do not know *who* has reduced gambling behaviour after the intervention. Nevertheless, the observed decrease in gambling frequency, expenditures and prevalence of problem gambling was significant, and it is difficult to see any alternative explanations to this decrease other than the removal of bank note acceptors on slot machines. The stability in observed gambling behaviour in the two years prior to the intervention as well as lack of any other significant changes in the gambling market during the observation period, suggest that it is reasonable to attribute these findings to the removal of the bank note acceptors on slot machines. A considerable strength of this study is the large samples and the high response rate at all three points of time of the data collection.

The motivation to regulate the Norwegian slot machine market was to limit and prevent gambling related problems - especially among adolescents. This study suggests that regulatory measures may have an effect – not only on the total expenditures on slot machines – but also on the extent of gambling related problems and excessive gambling. Research in this field is scarce and replication of the findings is warranted. A challenge for further studies in this area will therefore be to assess whether and to what extent the removal of note acceptors on slot machines may have had a similar effect in the Norwegian adult population,

and furthermore, whether this kind of intervention would have a similar effect in other countries and other kinds of gambling markets.

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Table 1. Demographic characteristics

	2004 n=20648	**2005** n=21260	**2006** n=20573
Gender:			
Males	49.3 % (10203)	50.1 % (10660)	49.6 % (10197)
Females	50.7 % (10481)	49.9 % (10600)	50. 4 % (10374)
Age:			
13-15	52.4 % (10847)	49.6 % (10522)	50.5 % (10416)
16-17	31.7 % (6564)	36.5 % (7729)	34.6 % (7136)
18 +	15.9 % (3292)	13.9 % (2956)	15 % (3090)

Table 2. Gambling expenditure and frequency (average) before and after the intervention.

Regression coefficients from multivariate methods.

	2004	2005	2006	O. R.	Adj regr Coef.
Gambling frequency slot machines:					
Times gambled last year	15	15ns	12***		-3.0***
Gambled once or more per week	11.3%	10.6%*	8.1%***	0.74***	
Expenditures:					
Slot machines (Euro last week/average/)[a]	3.40	3.10ns	2.40**		-0.7*
No expenditure on slot machines last week	80%	83%***	88%***	1.50***	
Adolescents spent > 125 Euro last week	5.3%	3.9%***	2.5%***	0.63***	
Gambling frequency all games:					
Times gambled last year	45	46ns	39***		-6.9***

[a] Cut-off 1125 Euro per week

ns = not significant

* = $p<0.05$

** = $p<0.01$

*** = $p<0.001$

Table 3. ‘At-risk’ and problem gambling before and after the intervention.

	2004	**2005**	**2006**	**O. R.**
SOGS-RA:				
Problem (4+)	2.4 %	2.9 %**	2.3 %***	0.80***
At-Risk (2-3)	5.9 %	4.9 %***	3.5 %***	0.71***
The Lie/Bet Questionnaire:				
Lie/Bet (2)	3.7 %	3.6 %ns	3.0 %***	0.83***
Lie/Bet (1 or 2)	10.8 %	10.2 %ns	8.5 %***	0.81***

ns = not significant
** = $p<0.01$
*** = $p<0.001$

Table 4. Prohibition of BNA – self-reported influence on gambling behaviour among adolescents gambled on slot machines last year (after intervention).

	n	Yes	No	No, gambles more	No, gambles less	Stopped gambling	Not sure
Have you noticed the removal of BNA on slot machines?	10947	31.4%	68.6%				
Do you now gamble as much on slot machines as you did before the removal of BNA?	9766	28.6%		3.2%	21.2%	47.0%	
If you have changed – is it related to the removal of BNA?	7420	6.7%	75.7%				17.6%