**Griffiths, M. D. (1994) The role of cognitive bias and skill in fruit machine gambling. *British Journal of Psychology, 85*. 351-369.**

**Background**

In this study Mark Griffiths is investigating some of the cognitive differences between regular and non-regular gamblers. In particular he is interested in discovering whether regular fruit machine payers think differently to non-regular players. That is, whether regular fruit machine players display cognitive distortions.

This particular study is not concerned with the factors which cause people to gamble such as personality, education or social environment but is interested in some of the cognitive biases that gamblers make which may encourage them to continue to gamble.

Wagenaar argues that gamblers use a range of cognitive distortions called heuristics. Heuristics are a set of rules for solving problems. Wagenaar (1988) argued that gamblers select heuristics at the wrong occasions and that these heuristics have the effect of reducing uncertainty.

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| Griffiths noted that in terms of gambling, the six most important cognitive distortions that regular gamblers use are, illusion of control, flexible attributions, representativeness, availability bias, illusory correlations and fixation on absolute frequency.  Illusion of control: This is the belief that we can control random events, such as choosing the winning lottery numbers or having a favourite fruit machine.  Flexible attributions: This is where gamblers attribute (explain) their own wins in terms of skill and their losses in terms of some external factor such as bad luck or a fluke.  Representativeness: This is where we make the mistake of believing that random events have a pattern, therefore believing that the probability of winning will increase with the length of an ongoing run of losses. For example, when tossing a coin 5 times and getting heads and believing that on the 6th time the coin must be tails.  Availability bias: This occurs when we are more likely to remember the times we or others win rather than lose. For example, there is more information available to us about people winning the lottery than there is about people not winning.  Illusory correlations: There are superstitious beliefs when people believe that two variables are related when in fact they are not. For example, rolling a dice softly to gain a low number or harder if you want a higher number.  Fixation on absolute frequency: This occurs when gamblers measure their success using the absolute rather than the relative frequency of wins. For example regular gamblers often do win more than non regular gamblers but this is because they gamble so much. They also lose more than non regular gamblers. |

The above heuristics or biases give some insights into why gamblers do not learn from their past losses and can help to explain irrational gambling behaviour. Although Griffiths does note that these heuristics cannot be used to predict behaviour because it is not possible to know which heuristics gamblers will choose to use on any specific occasion.

Griffiths noted that in some of his earlier studies many fruit machine gamblers did believe that their ability to play fruit machines was skilful. Furthermore, he notes that the introduction of specialist play features (such as nudge, hold and gamble buttons) stimulated the illusion of control bias through personal involvement and familiarity of a particular machine as well as being perceived as elements as skill.

It was also found in earlier studies that some addicted gamblers did recognise that they would eventually lose all of their money in the long run but that they could use their skills to stay on the fruit machines longer. That is, skilful playing can enable the gambler to stay on the machine longer.

Furthermore Griffiths also noted that in earlier studies those regular fruit machine players diagnosed as pathological gamblers had a greater perceived skill orientation than other less regular gamblers. This strengthens the argument that cognitive factors may be important in understanding persistent gambling as did the finding from earlier studies that gamblers use a variety of heuristics particularly when explaining away big losses or when giving reasons for bad gambling.

Following on from these earlier studies, this study set out to examine three factors in the cognitive psychology of gambling.

Firstly, Griffiths examined whether the skill involved in fruit machine gambling is in fact actual or perceived, by comparing the success of regular and non regular gamblers.

Secondly, this study examined the cognitive activities of regular and non-regular fruit machine gamblers while gambling using the thinking aloud method.

Thirdly subjective measures of skill perception in regular and non-regular fruit machine gamblers were examined using a post-experimental semi-structured interview.

**Aim**

The aim of this study was to investigate cognitive bias involved in gambling behaviour.

There were three main hypotheses:

1. There would be no difference between regular and non regular fruit machine gamblers on objective measures of skill.
2. Regular gamblers would produce more irrational verbalisations than non-regular gamblers
3. Regular gamblers would be more skill orientated than non-regular gamblers on subjective measures of self-report

A further hypothesis was also added that thinking aloud participants would take longer to complete the task than non-thinking aloud participants.

**Procedure/Method**

This study is using a quasi experimental approach. The main independent variable is whether participants are regular or non-regular gamblers.

The dependent variables are objective measurements of skill on the fruit machine, the content analysis of utterances from the thinking aloud method and the subjective measures of skill perception from the post-experimental semi-structured interview.

A further independent variable was created by a half of both the regular and non-regular gamblers being randomly assigned to the thinking aloud condition.

The sample consisted of 60 participants. The mean age of the participants was 23.4 years and 44 were males and 16 were females. All of the participants had played fruit machines at least once in their lives.

Most of the participants were recruited via a small poster advertisement circulated around a university and college campus. A number of the regular players were recruited via a regular gambler known to Griffiths.

The regular gamblers consisted of 29 males and 1 female and the mean age was 21.6 years.

The non regular gamblers consisted of 15 males and 15 females and the mean age was 25.5 years.

Regular gamblers were defined as those who gambled on fruit machines at least once a week.

Non-regular gamblers were defined as those who gambled on fruit machines once a month or less.

The study was carried out in 1989 and had the full consent of the arcades manager.

Each participant was tested individually at an arcade in the UK. All of the participants were asked to gamble on a fruit machine called Fruitskill which played at 10 pence a go.

Each participant was given 3 to gamble on the fruit machine which gave them 30 free gambles.

All of the participants were asked to try and stay on the machine for a minimum of 60 plays which means that had to break even and win back 3 from the money they had put in.

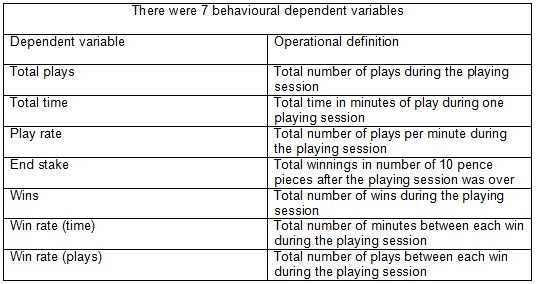
If they managed to achieve 60 gambles with the initial 3 stake they were given the choice of either keeping any of the winnings or carry on gambling.

To measure the participants objective skill levels, Griffiths recorded the gamblers behaviour.

Skill was defined as the ability of the individual to affect the outcome of the gambling positively (e.g. more gambles with initial money staked and/or more winnings with initial money staked).

The experimenter stood nearby recording the total time in minutes each participant was on the fruit machine, the total number of gambles, the amount of winnings and the result of every gamble.

The following table contains the 7 objective behaviours that were used to assess the skill levels of the participants.



To measure the participants irrational verbalisations, Griffiths devised the thinking aloud technique.

Irrational verbalisations were defined as those which were incompatible or contrary to reason (e.g. personification of the machine, use of heuristics).

The regular and non-regular fruit machine gamblers were randomly assigned to either the thinking aloud condition or non-thinking aloud condition.

The 30 participants who underwent the thinking aloud condition were given the following additional instructions:

*The thinking aloud method consists of verbalising every thought that passes through your mind while you are playing. It is important to remember the following points:*

*(1) Say everything that goes through your mind. Do not censor any of your thoughts even if they seem irrelevant to you;*

*(2) Keep talking as continuously as possible, even if your ideas are not clearly structured;*

*(3) Speak clearly;*

*(4) Do not hesitate to use fragmented sentences if necessary. Do not worry about speaking in complete sentences;*

*(5) Do not try to justify your thoughts.*

The participants assigned to the thinking aloud condition had their verbalisations recorded using a lapel microphone connected to a portable tape recorder. The experimenter transcribed all of the verbalisations made during the gambling session within 24 hours so that he could remember the context of the verbalisations.

A content analysis was performed on the transcriptions. Based on the utterances Griffiths created a coding scheme with 30 irrational and irrational utterances and a further miscellaneous category. Below is a full list of the categories used.

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| Irrational verbalisations  1. Personification of the fruit machine, e.g. The machine likes me  2. Explaining away losses, e.g. I lost there because I wasn't concentrating  3. Talking to the fruit machine, e.g. Come on, aren't you going to pay out for me  4. Swearing at the machine, e.g. You bastard  Rational verbalisations  5. Swearing/cursing, e.g. Shit, Damn, etc  6. Reference to loosing, e.g. I lost the whole pound there  7. Reference to winning, e.g. I won forty pence I think  8. Sarcastic reference to winning, e.g. Wow, I won ten pence  9. Saying No (including derivatives e.g. Nope, Nah etc.) in response to the machines reels  10. Saying Yes (including derivatives e.g. Yeah, Yo etc.) in response to the machines reels  11. Reference to the gamble button, e.g. I'm gonna gamble this twenty pence up to a pound  12. Reference to gambling in general, e.g. I like a gamble on this type of machine  13. Reference to a near win, e.g. I just missed out on a pound win there  14. Questions relating to confusion/non-understanding e.g. What's going on here  15. Statements relating to confusion/non-understanding, e.g. I don't understand this  16. Reference to skill, e.g. I only won that because I was so quick  17. Humour reference/joke, e.g. Two melons I like it when I get my hands on two melons  18. Reference to chance, e.g. It's just chance if there's a big payout  19. Reference to blank mind, e.g. My mind went blank I can't think  20. Reference to holds/features/nudges, e.g. I'm gonna hold them  21. Reference to the number system, e.g. I got a 2 there  22. Saying It's not worth it in reference to holding reel features  23. Reference to sudden understanding, e.g. I see. Now I understand how that button works  24. Reference to the machine being a waste of money/rip off etc, e.g. This machines a con  25. Hoping/needing a certain feature to appear in the win line, e.g. I need an orange to win  26. Reference to frustration, e.g. This is so frustrating  27. Saying (Lets) see what happens, (Lets) see what comes up  28. Reference to luck, being lucky, e.g. My luck’s in today  29. Saying I can't do anything or Nothing I can do (to improve chances of winning)  30. General questions, e.g. Do you think it's still raining outside  31. Miscellaneous utterances, e.g. I think I'll get a bag of chips after playing this |

A post experimental semi-structured interview was also carried out to measure the participants subjective opinions of their skill levels.

A number of questions relating to skill were asked. For example, participants were asked Is there any skill involved in playing a fruit machine And How skilful do you think you are compared with the average player What skill (if any) is involved in playing fruit machines

**Results**

Griffiths reported the results in three parts relating to each of the three main hypotheses.

*Analysis of the behavioural data.*

It was found that on the whole were was no difference in objective measures of skill between regular and non regular fruit machine gamblers.

This supports the first hypothesis that there would be no difference between regular and non regular fruit machine gamblers on objective measures of skill.

Although there were no significant differences in total winnings regular gamblers did stay slightly longer on the machines suggesting that there are skillful aspects to fruit machine gambling.

In relation to the fourth hypothesis the thinking aloud participants did take longer to complete the task than non-thinking aloud participants, although this was not significantly longer.

*Analysis of the verbalisations*

Using the thinking aloud method it was found that regular gamblers did make more irrational verbalisations than non regular gamblers. 14 percent of the regular gamblers verbalisations were irrational comments compared to 2.5 percent of the non regular gamblers.

The results also showed that regular gamblers made significantly more percentage verbalisations in just two of the categories these were personifying the machine (e.g. the machine likes me) and referring to the number system (e.g. I got a 2 there).

Non regular gamblers made significantly more verbalisations in questions relating to confusion and non-understanding, in statements relating to confusion and non understanding and miscellaneous utterances.

Although not significant, regular gamblers made more percentage verbalisations in the categories swearing at the fruit machine, referring to winning and explaining away loses.

Griffiths noted that regular gamblers did use a variety of heuristics, although these were not abundant. Below is just a selection of these heuristics.

Flexible attributions: I'm not doing to well here It must have paid out. This fruity is not in a good mood someones obviously won out of this before.

Illusions of control: I'm only gonna put a quid in to start with because psychologically I think it's very important it bluffs the machine it's my own psychology

Personification: This machine doesn't like me ooh it does, it's given me a number hates me!! It's given me low numbers, I don't think it wants to pay out at all It probably thinks I am a f\*\*kwit it's not wrong.

*Analysis of skill variables*

Based on the findings of the post-experimental semi-structured interview it was found that regular gamblers were more skill orientated than non-regular gamblers.

For example, when asked the question Is there any skill involved in playing a fruit machine most regular gamblers said equal chance and skill whereas most non regular gamblers said mostly chance.

In response to the question How skilful do you think you are compared with the average person regular gamblers claimed that they were at least of average skill, but more usually above average skill or totally skilled. Non regular gamblers an the whole viewed themselves as below average skill or totally unskilled

**Explanation**

Griffiths argues that this study shows that regular fruit machine gamblers are not significantly more skilled on fruit machines than non regular gamblers and that regular gamblers believe that their activity is far more skilled than it actually is. Interestingly regular gamblers were able to stay on the machines longer than non-regular gamblers suggesting that there are skillful aspects to fruit machine gambling. Griffiths suggests that many regular fruit machine gamblers know that they will lose every penny in the long run and they gamble to stay on the machine for as long as possible with the least amount of money.

The study supports the argument that regular fruit machine users do use cognitive biases when gambling. Griffiths argues that although regular gamblers do make more irrational verbalisations he is cautious about whether such findings do explain that the difference between regular and non-regular gamblers. Griffiths argues that more research needs to be carried out to discover whether the choice of heuristics is the underlying cause of irrational gambling behaviour or whether the choice of heuristics are the symptoms of a deeper underlying cause such as personality defects.

Griffiths argues that knowledge of the heuristics gamblers use could be used to rehabilitate gamblers through cognitive behavioural modification. This would involve modifying the thought patterns of an individual in an attempt to moderate or stop their gambling. Griffiths has termed this technique audio playback therapy and provides anecdotal evidence of its use. After this study participants were asked if they would like to listen to the recordings of their verbalisations. Four participants did take up this offer and one of these participants who was diagnosed as a pathological gambler (according to DSM-III-3 criteria) was met at a later date. He reported that his gambling behaviour had ceased after taking part in the experiment and that a large factor in the cessation of his gambling was hearing the playback of his recording. Hearing his verbalisations prompted him to examine and monitor his behaviour and through introspection he realised the futility of his own gambling.

It was also found that many regular gamblers in the thinking aloud condition had periods where they did not make any verbalisations. Griffiths suggests that this is because regular gamblers could operate the machine on automatic pilot, that is, they could gamble on fruit machines without attending to what they were thinking about. Griffiths calls this the escape mode as it has been found that many gamblers play for escapist reasons such as to forget about their physical disability, broken home, relationships and so on.

Evaluation of procedure

A major strength of this study was the amount and type of data collected. The behavioural data such as fruit machine gambling was quantitative and this allows for comparisons and statistical analysis to be made. Furthermore, the qualitative data collected from the verbalisations were quantified using content analysis again allowing statistical comparisons to be made. The transcripts and the post experimental semi-structured interview also provided qualitative data allowing the research greater insights into the heuristics used by the participants.

The thinking aloud method can be seen as a very useful way of assessing private thought processes as it allows the research to capture some of the thoughts of the participants as they actually gambled. However no method is perfect and it is doubtful whether this technique did capture all of the thoughts of the participants for example some participants may have censured their thoughts, would not be able to put into words their thoughts and of course there were periods of time (up to 30 seconds) when the participants were silent,

Griffiths did recognise that there was a problem with the inter-rater reliability of the coding system. Griffiths completed the coding of the verbalisations himself and had a second researcher code the same results but the inter-rater reliability was low. It was argued that this was primarily due to the second raters naivety of fruit machine gambling. Inter-rater reliability was also tested using a regular fruit machine gambler but this again proved difficult as the rater did not know the context in which the verbalisations were made

The study was carried out in an actual amusement arcade on a typical fruit machine which of course improves the ecological validity of the study. Allowing participants to either keep any profits or extend their gambling time also increases the ecological validity of the study. However, perhaps only allowing the gamblers 30 plays may not have been enough to demonstrate any skills that they may have as fruit machine skill might only become evident with prolonged play.

There could be issues with demand characteristics in the study. The participants were aware they were being studied and may have responded when verbalising their thoughts, playing the fruit machine or responding to the interview in ways they thought the experimenter wanted them to behave.

There could also be issues with social desirability particularly with the regular gamblers. In a later article Griffiths notes that some gamblers are dishonest about their gambling behaviour and are subject to social desirability factors and may be dishonest about their gambling activities to researchers.

Although Griffiths does not attempt to generalise the findings to other types of gamblers the sample can still be criticised. As with all volunteer samples we can question whether the participants are representative. There was of course only one female in the regular gamblers condition although young males are far more likely to be involved in regular fruit machine gambling than females. It would perhaps have been better to have matched the control group on gender.

There was a problem in the study in that some of the regular gamblers did not want to play on the chosen fruit machine and instead chose to play on their favourite one. Therefore some of the differences between regular and non-regular gamblers could have been caused by the different machine.