SUPERSTITION IN GAMBLING

Rosa Bersabé* and Rosario Martínez Arias*

*Universidad de Málaga, **Universidad Complutense de Madrid

The aim of this study was to test Skinner’s (1948) hypothesis on the acquisition of superstition behaviours. The main tenet of Skinner’s theory was that for conditioning to take place the most important factor is contingency, even if it is accidental. Three experiments were carried out with a dice game, with real money bets. In the first experiment subjects could sometimes throw the dice themselves and other times they had to let someone else throw for them. In the second experiment, gamblers were only sometimes allowed to choose the figure they wanted to bet on. Finally, in the third experiment, subjects played with and without a biomagnetic bracelet. We observed that gamblers were more confident of winning in the situations in which they had previously happened to win most. These results are discussed in the context of a reformulation of Langer’s (1975) hypothesis on illusion of control.

INTRODUCTION

One of the most important contributions to the study of cognitive bias in gambling is that of Langer (1975), with her experiments on the illusion of control. Langer’s hypothesis attempted to explain previous observations in which some people treated random events as controllable. For example, Henslin (1967) observed that dice players behaved as though they could control the result of the throw: when they needed low numbers they rolled the dice gently; when they needed high numbers they cast them in an energetic fashion. Previously, Strickland, Lewicki and Katz (1966) had shown experimentally that gamblers bet more money and were more confident of winning when they threw the dice themselves than when someone else threw for them. Finally, in the third experiment, subjects played with and without a biomagnetic bracelet. We observed that gamblers were more confident of winning in the situations in which they had previously happened to win most. These results are discussed in the context of a reformulation of Langer’s (1975) hypothesis on illusion of control.
them spun round two or three times; another two rocked
to and fro in some way; another banged its head against
a corner of the cage. None of these responses had appe-
tared systematically in the period of adaptation to the
cage, prior to the reinforcement programme. It would
appear, then, that the pigeons, like dice players, develo-
ped rituals with which to control reinforcement.

Skinner suggested that this occurred because, on admi-
nistration of the first reinforcer, the pigeon happened to
be carrying out a certain behaviour. Food increased the
probability of repetition of this behaviour. If a second
reinforcer was applied within a short space of time, the
same contingency accidentally occurred again (the beha-
viour was followed by food), so that, once more, the pro-
bability of the superstition behaviour appearing would
increase. Skinner (1948) begins his article by stating that
"to say that a reinforcement is contingent with a respon-
se only means that it follows the response" (p. 64). That
is, the essential factor in conditioning is contiguity.
Thus, conditioning can occur even when the behaviour
has not actually caused the reinforcement. Attempts
have been made to extrapolate these results with pigeons
to humans in various contexts (Ono, 1987; Matute,
1993; Bleak and Frederick, 1998; Pisacreta, 1987),
including that of games of chance or gambling (Keren
and Wagenaar, 1988; Brown, 1993).

The present work aims to investigate whether chance
contingencies that occur to a gambler may provoke
some kind of superstition. With this objective, we desig-
ned three experiments with the game of dice. In the first
two we included an element characteristic of situations
of skill. The initial hypothesis was that if the gambler
happened to win more in the first few throws when s/he
threw the dice himself/herself (Experiment 1) or chose the
figure (Experiment 2), then in the following throws s/he
would be more confident of winning in these same con-
ditions. If, on the other hand, s/he won more when s/he
did not throw the dice or choose the figure himself/herself,
we would expect the gambler to invert his/her preferen-
ces –even though this contradicts Langer’s hypothesis
on illusion of control. The third experiment included an
external element (a biomagnetic bracelet). We felt the
gambler might consider the bracelet as a lucky charm, or
as a predictor of negative results, depending on his/her
experience in the game(s) in which s/he wore it.

EXPERIMENT 1

METHOD

Subjects
23 third-year students from the Universidad
Complutense in Madrid (UCM). They collaborated
voluntarily, but were told that participation would win
them an extra mark in one of their course assessments.
Total number of valid cases was 18 (4 males and 14
females, aged between 20 and 24). The remaining cases
were discarded because in the first 20 throws the gam-
bler won the same number of times regardless of whether
they threw the dice themselves or someone else threw for them.

Design
Factorial 2x2 design with repeated measures in the
second factor.

Independent variables
Between-subjects variable was type of contingency that
occurred in the first 20 throws. This was defined opera-
tionally (Alloy and Abramson, 1979) as the difference
between the probability of winning when the gambler
threw the dice (p(W/T)) and when they were thrown for
him/her by someone else (p(W/NT))

Contingency = (p(W/T))- (p(W/NT))

Subjects were assigned to one of the following two conditions:
Positive contingency. If in the first 20 throws the gam-
bler won more times when s/he threw the dice than when
s/he did not throw them.

Negative contingency. If in the first 20 throws the gam-
bler won more times when s/he threw the dice than when
s/he did not throw them.

A second, within-subjects independent variable was
also established. This was active participation, with two
conditions:
1) When the subject himself/herself threw the dice.
2) When another person threw the dice for him/her.

The two gamblers (subject and experimenter-gambler)
took turns at throwing, in order to counterbalance the
levels of this variable.

Dependent variable
This was confidence in winning. In order to measure this
variable, subjects were asked to estimate the probability of
winning for each throw. The mean of subjective pro-
babilities (f) was found, and this was compared with the
proportion of times the subject actually won (d):

Bias = f - d

Bias can have scores between -1 and 1 (Yates, 1990). A
positive Bias indicates subject’s overconfidence in win-
ing: the subjective probabilities of winning are greater
than the proportion of times s/he actually wins. Negative
Bias reflects underconfidence in winning. Null Bias
indicates a perfect calibration.

This measure was calculated from the 10 probability
judgements emitted for the last 20 throws: 10 when the

VOLUME 4. NUMBER 1. 2000. PSYCHOLOGY IN SPAIN

29
subject him/herself was throwing the dice, and 10 when they were thrown for him/her.

**Procedure**
The experiment was carried out in an experimentation cubicle in the Psychology Faculty at the UCM, and was applied individually to each subject. The two experimenters involved were unaware of the initial hypothesis. One of them played the role of the banker in the dice game, as well as reading the instructions and noting the subject’s responses. This experimenter-banker sat at one side of the table, which was covered with a green baize cloth, whilst the experimental subject and the other experimenter sat at the other side. The experiment began with the bank giving twenty 25-peseta coins to the experimental subject with which s/he would place his/her bets in the game. Subjects were told that they could win up to 4,500 pesetas or lose the 500 they had just been given, and which now belonged to them.

Two people participated, as far as betting was concerned, in the game: the banker and the subject-gambler. The rules were very simple: the dice (5 poker dice) were thrown from the cup once. The winner was the player with the highest number of similar dice with or without jokers (the ace). If the two gamblers threw the same, the winner was the player with the hand of highest value, according to the following order: K, Q, J, Reds and Blacks. In the event of a tie, the banker always won. The banker always threw first, after which the subject-gambler bet a minimum of 2 coins and a maximum of 4, and then threw the dice. If the subject-gambler won the throw, s/he won the same number of coins as s/he had bet; if s/he lost, the bank took the money that had been bet.

The variable “active participation” was manipulated by making the subject-gambler and the experimenter-gambler take turns to throw the dice, although the bets were always placed by the subject.

Before beginning the game proper there were two trials, so that subjects could become familiar with the rules and procedure. After clearing up any doubts the subject may have about the game, the banker explained to him/her about estimating the probability of winning. The subject was to estimate his/her confidence in winning after the banker had thrown and before making a bet. The estimation was to be made in terms of percentages. Thus, an estimation of 25% would mean that one of 100 games in which the banker threw that combination of dice, the subject-gambler would win 25 times and lose 75 times. The gambler could estimate any percentage between 0 and 100, bearing in mind that a percentage over 50 meant that s/he expected to win the throw, while an estimate below 50% meant s/he expected to lose. It was emphasised that the task consisted not in calculating probabilities, but rather in estimating one’s own confidence in winning.

Three further trials were carried out, now incorporating the probability judgements. The game itself then took place, which consisted of 40 throws. The first 20 served to assign the subject to a contingency group: positive if s/he won more when throwing the dice him/herself, and negative if s/he won more when the experimenter-gambler threw. The following 20 throws were used to analyse the gambler’s confidence in winning in two conditions: when s/he threw the dice and when they were thrown on his/her behalf.

**RESULTS**
For each of the four combinations of experimental levels the means and standard deviations of Bias (mean subjective probability minus actual proportion of wins) were calculated. These are shown in Table 1.

Data were analysed by means of an ANOVA for two factors, using the statistical program SPSS. The main effect of type of contingency (positive if in the first 20 throws the gambler won more when s/he threw the dice; negative if s/he won more when they were thrown for him/her) was not found to be statistically significant (F(1, 16)=0.09; p=0.767). This indicates that, in the second block of 20 throws (regardless of who threw the dice), confidence in winning of gamblers exposed to a positive and a negative contingency was similar. In principle it was not expected to find differences between these two levels of the variable.

Likewise, in this second block of 20 throws (regardless of type of contingency received) subjects did not show more confidence when they could participate actively by throwing the dice. This was demonstrated by the fact that the main effect of the variable “active participation” was not found to be significant (F(1, 16)=0.01; p=0.925).

<table>
<thead>
<tr>
<th></th>
<th>Positive contingency</th>
<th>Negative contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>Throw dice</td>
<td>0.075 (0.213)</td>
<td>-0.045 (0.160)</td>
</tr>
<tr>
<td>Not throw dice</td>
<td>-0.026 (0.248)</td>
<td>0.045 (0.152)</td>
</tr>
<tr>
<td>Choose</td>
<td>0.224 (0.157)</td>
<td>0.154 (0.171)</td>
</tr>
<tr>
<td>Not choose</td>
<td>0.172 (0.127)</td>
<td>0.216 (0.142)</td>
</tr>
<tr>
<td>With bracelet</td>
<td>0.032 (0.170)</td>
<td>-0.069 (0.134)</td>
</tr>
<tr>
<td>Without bracelet</td>
<td>-0.037 (0.094)</td>
<td>0.016 (0.210)</td>
</tr>
</tbody>
</table>

1 translator’s note: 1 euro=166.386 Ptas
This result fails to corroborate the hypothesis of illusion of control, under which we should have found a difference in favour of the condition in which the gambler participates actively by throwing the dice him/herself.

The only effect that did approach statistical significance was that of interaction (F(1, 16)=4.04; p=0.062), represented graphically by the crossing lines in Figure 1.

Those subjects that won more on throwing the dice in the first group of throws (positive contingency) subsequently showed more confidence in winning when they threw again. Inversely, those exposed to negative contingency (in the first group of throws they won more times when the experimenter-gambler threw for them) subsequently felt more confident when the dice were thrown on their behalf. That is, the confidence in winning shown by gamblers when they throw the dice or when they are thrown for them depends on their previous experience in the two situations. This can be described perfectly well as superstition behaviour.

EXPERIMENT 2

METHOD

Subjects
23 Psychology students with similar characteristics to those of the first experiment. Finally, 20 valid cases remained: 3 males and 17 females.

Design
The design was once again 2x2 factorial with repeated measures in the second factor. The between-subjects factor was again type of contingency (positive if in the first 20 throws the gambler won more when s/he chose the figure; negative if s/he won more when it was chosen for him/her). The only variation with respect to the first experiment was that the second factor (“active participation”) was substituted by choice of figure (K, Q, J, Reds or Blacks). This second, within-subjects factor also had two conditions: when the subject could choose the figure and when s/he could not choose.

RESULTS

In the first four experimental groups a positive mean Bias was found –i.e., overconfidence: the subjective probabilities of winning were higher than the proportion of times the subjects won (see Table 1). This may be due to the fact that, in this second game, it was more probable that the throw resulted in a tie. In this situation the bank wins, so that the real proportion of wins for the gambler decreases, and his/her Bias increases.

The results provided by the two-factor ANOVA are along similar lines to those of the first experiment. The main effects of type of contingency (F(1, 18)=0.05; p=0.828) and choice of figure (F(1, 18)=0.02; p=0.888) were not found to be significant. Once more, we find a failure of the attempt to create an illusion of control by the addition of an element characteristic of skill situations: the possibility of choice.

As regards the interaction between the two factors (Figure 2), the tendency found in the first experiment was repeated (F(1, 18)=3.45; p=0.080). Gamblers that initially won more when they chose the figure themselves (positive contingency) showed more overconfidence.
in the subsequent throws where they could choose. Precisely the opposite occurred in the negative contingency group.

**EXPERIMENT 3**

**METHOD**

**Subjects**
23 students with similar characteristics to those of the first two experiments. Of these, 18 cases turned out to be valid for our research (5 males and 13 females).

**Design**
Factorial 2x2 design with repeated measures in the second factor. The first factor, between-subjects, was type of contingency: positive if in the first 20 throws the subject won more while wearing a biomagnetic bracelet than without it; negative if in these first 20 throws the subject won more without the bracelet than with it. The second factor, within-subjects, was wearing bracelet (a RAYMA biomagnetic bracelet, silver-plated with gold tips). Each subject played in the “wearing” and “not wearing” conditions.

In the second block of 20 throws we once again calculated Bias as an index of subjects’ confidence in winning.

**Procedure**
The procedure was identical to that described in Experiment 1. The only difference was that, in this third experiment, it was always the gambler him/herself that threw the dice: five consecutive throws wearing the biomagnetic bracelet, and five consecutive throws without it. These two conditions were counterbalanced so that half the subjects began the game wearing it and the other half threw first without it.

In the instructions subjects were told that the study had been commissioned by a pharmaceutical company researching the properties of the biomagnetic bracelet. In this way we both justified the fact that they had to wear the bracelet and concealed the true objective of the study.

**RESULTS**
In the first 20 throws subjects were no more confident of winning after being exposed to positive contingency than they were after exposure to negative contingency (F(1, 16)=0.13; p=0.721); nor were they more confident when throwing with the bracelet than without it (F(1, 16)=0.06; p=0.808).

What we did observe was an interaction effect even more statistically significant than in the previous experiments (F(1, 16)=0.23; p=0.027). This effect can be seen clearly in Figure 3. Gamblers that in the first throws won more while wearing the bracelet (positive contingency) considered it as a lucky charm. On the other hand, those that in the first throws lost more while wearing the bracelet subsequently felt less confident of winning when they wore it.

**DISCUSSION**
In the dice games prepared for the first two experiments we included elements characteristic of skill situations. In spite of this, and contrary to Langer’s (1975) hypothesis, no illusion of control was induced. This divergence in results may be attributed to the fact that in Langer’s research confidence in winning was assessed on only one occasion, while in our study each subject played 40 times, and estimated 40 subjective probabilities. Other works have also shown how the illusion of control fades away when the gambler is faced with a series of games (Koehler, Gibbs and Hogarth, 1994; Budescu and Bruderman, 1995). The first authors maintain that people assess probabilities better when they can see how results vary over a series of games (or in this case throws), thus demonstrating their random nature. This explanation was quite encouraging, since it pointed to a simple strategy for countering the illusion of control: repeat the game.

The other side of the coin is that, when the game is repeated, the subject is exposed to an experiential situation in which, as in the natural conditions of a game, relations between variables can be inferred. The situation is propitious for the appearance of superstition behaviours. In fact, in the first experiment it was found that, if at first the gambler had won more times when s/he threw the dice him/herself (positive contingency), s/he subsequently felt more confident when s/he could throw them. And the inverse: if s/he had won more times when the dice were thrown for him/her (negative contingency), s/he subsequently felt more confident when s/he did not throw them. This interaction effect was also found in the other two experiments.
By means of a meta-analysis (Rosenthal, 1978), we studied jointly the statistical significance of the simple effects averaged among the 3 experiments. In the positive contingency group we found superstitions in favour of throwing the dice, choosing the figure or wearing the biomagnetic bracelet ($Z=2.27; \ p=0.023$, bilateral). On the other hand, in the negative contingency group just the opposite was preferred: not throwing the dice, not choosing or not wearing the bracelet ($Z=2.64; \ p=0.008$, bilateral).

Thus, it was the contingency to which subjects were exposed that influenced whether they expected to win more in one situation than another, even if this contradicted what would be expected in terms of an illusion of control. These results are coherent with the hypothesis of Skinner (1948) on the acquisition of superstition behaviour: the most important factor in the production of an operant conditioning is contingency, even if this has been produced in a fortuitous way.

This interpretation of the facts is not totally incompatible with Langer’s (1975) hypothesis, but it is more general. What Langer suggests is that when an organism has been exposed to a controllable situation, in which reinforcement was contingent upon particular responses, these responses will continue to be emitted in situations that are similar though uncontrollable.

Thus, there was also at some point a contingency that became generalised.

In sum, it is proposed –in accordance with Alloy and Tabachnik (1984)– that to evaluate the relationship between two events information is taken form two sources: previous ideas and situational information. In gambling, previous ideas would be more conditioned by the illusion of control, that is, by the generalisation of contingencies learned in skill situations. Over the course of a series of games, judgements would be gradually adjusted using the situational information acquired. Therefore, the initial illusion of control would give way to superstition behaviour as the game is repeated.

In one way or another, gamblers continue to be the prisoners of their irrational beliefs. Nevertheless, there have been few attempts to incorporate cognitive restructuring into therapy for compulsive gamblers. González (1992) reviewed studies on treatments applied to this pathology. He observed that the majority of treatment programmes were oriented towards professional advice, group psychotherapy and, above all, attendance at self-groups such as Gamblers Anonymous.

From another therapeutic perspective, behaviour modification proposed, initially, aversive techniques (Barker and Miller, 1968), which have currently fallen into disuse. Later on, this approach gave way to imaginal desensitisa-
REFERENCES