

The Psychology of the Near Miss

R. L. Reid

Department of Psychology, University of Exeter, England

Near misses are widely believed to encourage future play, even in games of chance where the probability of winning remains constant from trial to trial. Some commercial gambling systems, particularly instant lotteries and slot machines, are contrived to ensure a higher frequency of near misses than would be expected by chance alone. Theoretical interpretations and relevant experiments are examined. A distinction is drawn between possible short-term and longer-term effects of manipulating the rate of occurrence of near misses.

A *near miss* is a special kind of failure to reach a goal, one that comes close to being successful. A shot at a target is said to hit the mark, or to be a near miss, or to go wide. In a game of skill, like shooting, a near miss gives useful feedback and encourages the player by indicating that success may be within reach. By contrast, in games of pure chance, such as lotteries and slot machine games, it gives no information that could be used by a player to increase the likelihood of future success. Of course that does not imply that the player's behaviour will be unaffected. Gamblers frequently act as if they think they can influence chance outcomes. Whispering to dice, throwing gently for a low number, choosing a lottery number carefully by using family dates of birth or consulting books of lucky numbers, are common examples of ineffective actions of this kind. In such cases, the occurrence of a near miss may be taken as an encouraging sign, confirming the player's strategy and raising hopes for future success. For example, one of the English football pools winners interviewed by Smith and Razzell (1975) vividly described a near miss, his impression of drawing near to the goal itself, and his feeling that it would have been foolish to quit at a time when he was so close to winning.

The first four experiments reported in the text were carried out by Amanda Shattock, supported by a Grant from the Social Science Research Council.

The conception of randomness of outcome is difficult to grasp and misconceptions are common. In everyday thinking "luck" is often regarded as a variable that can have different values at different times. A near miss can be taken as a sign that "luck" has changed value. What statisticians have to say about chance is not easy for most people to understand and when understood may not be fully accepted as a description of the real world. Even among the authors of books on gambling there are some who reify luck. Bergler (1958) has claimed that it is a well-known fact that beginners are frequently lucky in games.

In order to find out more about everyday beliefs concerning the effect of seeming to come near to winning in games of chance, the subject was discussed informally with 50 people, including university colleagues, students, schoolteachers, and casual acquaintances from many different backgrounds. The general consensus was that coming near to winning, e.g., a slot machine or lottery result correct up to the last element, would normally be "encouraging," if it had any effect at all. The most frequent alternative suggestion was that it would be "frustrating" or "irritating," both words seeming to have roughly the same meaning. A few suggested that a near miss would be both encouraging *and* frustrating. There were some mentions of "trying harder" after a near miss, although the discussants had been asked to think of situations in which this phrase could have no meaning beyond "trying again." There was a noticeable tendency to think of gaining information from a near miss even when the outcome could only be a matter of chance. A problem for the interviewer was that opinions were put forward tentatively, and further questioning sometimes led to revoking rather than clarifying the view that had been expressed. Finally, a simple attempt at quantification with a selected group of slot machine players produced the result that 18 out of 20 agreed with the statement that a near miss encourages further play.

Apart from any effect that it may have on the player's interpretation, a near miss may act more directly at a lower cognitive level by producing some of the excitement of a win. The "let down" that results from failure at the last step will be proportional to the degree of prior excitement. Kahneman and Tversky (1982) consider the case of a lottery with 865304 as the winning number and three clients who hold tickets 361204, 965304 and 865305. They claim that the first of these would be least upset and the last would be devastated. The degree of frustration is thought to depend upon the ease with which the more desirable alternative outcome can be imagined and the experience of regret arises as a special form of frustration. What the players would be expected to do as a result is not made clear, but Loftus and Loftus (1983) have suggested that taking the opportunity to play again may be a way of eliminating regret.

At a more behaviouristic level it is conceivable that a near miss may to

some extent have the same kind of conditioning effect on behaviour as a success. Skinner (1953) commented on what he considered to be an effective use of conditioned reinforcers made by some gambling devices. For example, a slot machine reinforces the player when certain arrangements of three symbols appear in the window. By paying off very generously—with the jackpot—for *three bars* the device eventually makes *two bars* plus any other figure strongly reinforcing. "Almost hitting the jackpot increases the probability that the individual will play the machine, although this reinforcement costs the owner of the device nothing."

The effect of a near miss can also be considered in terms of frustration theory (Amsel, 1958). This theory leads to the same prediction as reinforcement theory, not surprisingly since Amsel (1968) has recognized the operational equivalent of the two. In Amsel's terms, failure to reach an anticipated goal produces frustration which acts to strengthen ongoing behaviour.

The weakness of all the interpretations that have been considered is that they indicate only the possible short-term effects of an occasional near miss. They do not enable clear predictions to be made about what could be expected in the long run when games are rigged so as to increase the frequency of near misses.

Some commercial gambling systems appear to be based upon the expectation of a long-term positive effect. Scarne (1975), describing the historical development of slot machines, asserts that in most of the early machines only 10 out of 20 symbols could appear on the payline. The dummy signals were effective as "bait" because they often formed winning combinations visible to the player just above or just below the payline. Paying combinations were more likely to appear as near misses, above or below, than as real wins on the payline itself. Scarne also describes machines in which the third reel could be "bugged" by the operator so that the machine would slip the final symbol off the jackpot to rest just up or down from the payline. He accepts that the effect of the near misses is to "keep the customer putting in the nickels."

The *Report of the Royal Commission on Gambling* (1978) discussed "instant" lotteries and commented unfavourably on an advertized system which had claimed that its inclusion of many "heart stoppers" would help to make it a success, a "heart stopper" being an instant lottery ticket which gives the illusion of coming close to winning a big prize. In British "instant" lotteries the purchaser of a ticket scrapes off an opaque coating to reveal various symbols. Prizes are given for three of the same kind. My own sampling of tickets revealed a higher frequency of pairs of symbols, especially those of higher denomination, than would be expected by chance alone. The fact that the Royal Commission put "heart stoppers" in the category of "abuses" indicates their belief that artificially increasing the chance of a near miss actually increases play.

A literature search disclosed only one relevant experiment. Strickland and Grote (1967) observed that slot machines (one-arm bandits) usually have a relatively high proportion of potential winning symbols on the wheel that stops first, and that these symbols appear less often on the second wheel, and rarely on the third. They arranged a simplified form of machine to display only red bars or green bars, with 70 percent red on the first wheel, 50 percent on the second, and 30 percent on the third. By prescribing *three reds* or *three greens* as the winning combination they could present players with a relatively high frequency of winning symbols either early in the outcome sequence, or late, while keeping the probability of a win constant at $p = 0.105$. As a control for any effect that might be due to colour alone, the first and third wheels were interchanged for one-half of the subjects.

Each of the 44 male high school students who took part was given 100 nickels with which to play, receiving 40¢ as payoff for wins. Thereafter players could choose to stop at any time, retaining one-half of their holdings. The hypothesis was that those who had experienced a higher proportion of winning symbols on the reel that stops first would continue playing longer than those for whom winning symbols more often appeared on the last reel to stop. The result was that 13 of the 22 subjects who experienced the higher frequency of near misses continued playing, while only 5 of the other group did so. ($X^2 = 4.61$, $p < .05$). The subjects of the two groups who played on did not differ in the number of trials they then completed although they continued to experience different rates of occurrence of near misses. This may indicate that the effect was fading out. The outcome of the experiment was discussed in terms of states of "hope" and "disappointment" as conceived by Mowrer (1960) and the authors concluded "It seems that early, frequent, and extended anticipation of a win promotes continued playing."

Following Strickland and Grote's experimental design, three experiments were carried out at Exeter with 56 subjects who drew *red* or *black* cards from three piles in which the proportions were arranged to match those of the Strickland and Grote slot machine. The effect of near misses was expected to show up (a) in extended play (Experiment 1), (b) in choice of betting on the colour associated with the higher frequency of near misses (Experiment 2), (c) in deciding to bet or not to bet (Experiment 3). No indication of an effect of differences in the ratio of near misses to wins was found, although the results did confirm other expectations: a negative recency effect (gambler's fallacy), post-reinforcement pauses after wins, and a primacy effect indicating that early winning may have had more influence on behaviour than late winning.

A further experiment was carried out with a simulated slot machine, rigged in the way described by Strickland and Grote (1967). The 48 subjects who took part were assigned to a Near Miss or an Early Lose group by prescribing their winning lines as *three reds* or as *three greens*. In order to make play more interesting and to study the "illusion of control" (Langer, 1975) half of the subjects were given the opportunity of pressing buttons to

stop the display in each window in turn, from left to right. The first twenty plays were obligatory. Thereafter a subject could cash in tokens, or continue playing at one token per play.

All but four of the subjects played on. No evidence was obtained to indicate that the "illusion of control" made subjects more likely to continue play. The results for the near miss group were in the expected direction since on average they played longer than the early-lose group, but an analysis of variance did not attach an acceptable level of statistical significance to this finding.

Dr. Strickland has been good enough to comment on these results in relation to his own. Although this experiment was not intended to be an exact replication of his, the conditions may be similar enough for the discrepancy to call for an explanation. We find ourselves in agreement in supposing that the difference in results may be due to differences in the background experience of those who took part. Strickland and Grote's subjects were rural high school students who would have had little if any experience of gambling, while the group at Exeter were older university students, more than one-half of whom were betting once a month, or more. If correct, this explanation may suggest that the near miss effect diminishes and perhaps fades out entirely with increasing experience and sophistication about gambling systems.

One other difference may also be important. A feature of the procedure used by Strickland and Grote was that on each trial the subject was required to read aloud the outcomes on each reel. This feature, not included in the Exeter procedure because it was thought to be uncharacteristic of gambling, may have increased the aversiveness of early losing by forcing the subjects to attend to success symbols on later reels after seeing that they had failed on the first reel. It is possible that this negative effect, rather than any positive effect of near misses, may have produced the observed difference between the two groups.

To increase the proportion of near miss trials in relation to wins seems likely in the long term to be self-defeating, like calling "Wolf!" Repeated exposure to near miss stimuli will reduce their value as signals that success is on the way. This process would be expected to occur by cognitive restructuring at the level of the subject's awareness of relative frequencies. It would also be expected to reduce the value of a stimulus, acting as a conditioned reinforcer, in the way that Skinner suggests, because it has the effect of increasing the number of occasions on which the stimulus is *not* followed by the reinforcement of a win. From the somewhat different point of view of Amsel's theory (1958) frustration arises from failure to reach an anticipated goal. In the long term an increase in the frequency of near misses relative to wins will reduce anticipation and so also reduce frustration.

All three points of view suggest that any initial effect of augmenting the

rate of occurrence of near misses would not be maintained, but the theoretical variables would have to be quantified before precise predictions could be made. The end point might be a residual positive effect, or zero, or even a negative value.

The most rapid adjustment to be made to an increased experience of near misses without wins is to change one's conception of what is a near miss. A recent promotion of a brand of gasoline on sale in the UK took the form of giving away pieces of paper printed in the style of *left* or *right* halves of currency notes of different denominations from 50 pence upwards to £10,000. A customer who could produce two matching halves, left and right, could claim the sum printed on the note. Many were excited to find themselves in the possession of half of a promise of £10,000, assuming naively that they were halfway towards success. Cognitive restructuring was rapid when they received their second and third identical left halves and compared notes with their friends.

Yet tricks like this can succeed for a time, against a background of ordinary expectations of probabilities. Less extreme forms of "doctoring" may go undetected or at least take longer to detect. Underlying behavioural processes affecting secondary reinforcement or frustration would be slow to take effect in cases of minor manipulation. A worrying thought for those who wish to regulate gambling is that some variables that influence participation in a game may not be strong enough to be detected in laboratory research, but may yet be powerful enough to be worth manipulating for commercial purposes, especially when the cost of the manipulating may be negligible.

If, as is generally agreed, most slot machine players claim to be playing for entertainment, should it be assumed that any feature that makes play more attractive can be regarded as giving them better value for their money?

At the heart of any game is a distinctive procedure for the determination of outcome (Doo). The most general characteristic of the near miss is that a high degree of uncertainty is preserved right up to the final step of the Doo. Organizers of races and other contests match the ability of competitors as closely as they can and then may carry out "fine tuning" by means of handicaps and penalties. The object is to make the outcome as difficult as possible to forecast at the start. Forecasting improves step by step as the Doo progresses.

Horse racing provides some of the most dramatic examples of near misses in the form of "close finishes" and punters most commonly refer to "close finishes" when asked to describe the features of a good race. The importance of this variable was strongly confirmed in a simple computer simulation, carried out at Exeter, of some of the characteristic features of racing. Five horses, represented by sets of dots that could be given a movement suggesting galloping, moved across a screen from start line to finishing line, all at the

same fixed pace except that small increments of forward movement were frequently added at random to one horse or another. This was found to produce very convincing sets of races. The principal feature of those races that were judged to be "good," "interesting," or "exciting" was the "closeness" of the finish. The "worst" races were those in which the outcome was decided early in the race by the runners separating and maintaining their places. Obviously a race is "good" if your chosen runner actually wins. Apart from that, interest is related directly to the rate at which the forecast of the final outcome improves throughout the race—the races judged best postponing the resolution of outcome to the very end and so giving more opportunities for near misses. But it should be noticed that the judgements of "goodness" were made within a set of random races and that it does not follow that a subset of races selected for close finishes would in the long term be more entertaining than a random sample. Variety would be lost, interest in the early stage of races would wane, and the conceptions of a close finish would change to fit a new context.

What happens when the player can choose different strategies for determining the outcome? In a laboratory exercise subjects played a melding type game in which they had to draw three cards, one from each of three packs, in order to win. Aware that the probabilities of success with each pack were different, they were free to draw in any order. The most common strategy was to "stay in the game," drawing first from the pack that offered the best chance of success, and saving up the less likely draw to the end. But a group presented with the same situation conceived as a task went in the opposite direction, towards "being efficient" rather than playful, and choosing for their first draw the pack that was most likely to settle the outcome. In both cases, game and task, the middle option was seldom taken first.

So people may spontaneously expose themselves to near misses in playful mood by staying in the game and stretching out the determination of the outcome, while being serious and businesslike in other situations by settling the issue with least effort, and at the earliest opportunity. (Of course in everyday life there are some who play at work or work at play).

Perhaps psychologists should take games more seriously. A lot of time and money is spent in playing them and so far little has been done towards studying their structural characteristics. Central to any game is a distinctive prescription of how the outcome is to be decided (Doo). The rules are contrived to spin out the reduction of uncertainty and resolution of the outcome, while maintaining the interest of participants and spectators. The study of the near miss is a small part of an attempt to gain an understanding of such things.

REFERENCES

- Amsel, A. (1958). The role of frustrative nonreward in noncontinuous reward situations. *Psychological Bulletin*, 55, 102-119.
- Amsel, A. (1968). Secondary reinforcement and frustration. *Psychological Bulletin*, 69, 278.
- Bergler, E. (1958). *The Psychology of Gambling*. London: Hanison.
- Kahneman, D. & Tversky, A. (1982). The Psychology of Preferences. *Scientific American*, January, 136-142.
- Loftus, G. R. and Loftus, E. K. (1983) *Mind at Play*, New York: Basic Books.
- Langer, E.J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, 32, 311-328.
- Mowrer, O.H. (1960). *Learning Theory and Behavior*. New York: Wiley.
- Royal Commission (1978). *Report of the Royal Commission on Gambling*. Command 7200. London: H.M.S.O.
- Scarne, J. (1975). *Scarne's New Complete Guide to Gambling*. London: Constable.
- Skinner, B.F. (1953). *Science and Human Behavior*. New York: Macmillan.
- Smith, S. & Razzell, P. (1975). *The Pools Winners*. London: Caliban Books.
- Strickland, L.H. & Grote, F.W. (1967). Temporal presentation of winning symbols and slot machine playing. *Journal of Experimental Psychology*, 74, 10-13.