# Gambling Behavior and Information Processing Biases

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Humans tend to exhibit rather consistent biases when cognitively processing information. In a gaming environment, these biases can affect participation in games of chance. The availability bias reduces complex probalistic judgments to simpler ones through the ease to which relevant instances can be brought to mind. The representativeness bias improperly attributes characteristics to an entity or process based on evidence received in a limited setting. Biasing factors appear to be affected by individual differences and situational factors. The effect on gambling may manifest itself in terms of duration of play, money played, and satisfaction or dissatisfaction with play. Implications for treatment of pathological gamblers are discussed.

Humans are imperfect processors of information. Recent psychological findings, which are discussed later in this article, have indicated that certain rather consistent biases exist during information processing. Some of these biases have important implications for gambling behavior, although little or no work has been accomplished to relate them to the gaming area. This paper attempts to identify the relevant research and develop a framework for use in understanding human responses in gaming environments. It also may indicate fruitful areas for future research in gaming.

A frequent observation made about the behavior of humans is that they develop characteristic modes of thinking, adapting, and responding. Much of psychology is concerned with the conditions that attend the development of these orientations. A major aspect of this concern is the way in which the individual processes the information received in a given setting. Humans tend

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to develop programs or sets of rules which they use to simplify the processing of information (Schroder, Driver, & Streufert, 1967). The rules used in a given situation can have a major impact upon the behavior exhibited.

For example, when a decision maker is faced with an uncertain outcome, the probability of occurrence of the event in question must in some way be assessed. How likely or unlikely the event appears to the decision maker can have a major impact on his future actions. For an individual in a gaming environment, perceived chances of winning, along with expected payoffs, can affect the extent of participation in the game or games of chance. The method used to develop beliefs about chances of winning, therefore, can be an important factor in gambling activity.

The personal assessment of probabilities can take one of three forms (Nisbett & Borgina, 1975). The individual can make an analysis of the physical characteristics of the device producing the outcomes, and from this investigation determine the relevant chances of occurrence. The chance of a one-spot appearing on a die, for example, is easily assessed in this manner, i.e., one chance in six. If the physical mechanism is complex or not easily understood, probabilities can be determined through observing past relative frequencies and using this value to judge future occurrences. The chance of getting three cherries to appear on a slot machine can be estimated by observing the past relative frequency of their occurrence. When past relative frequencies are difficult to obtain, it is necessary to make subjective determinations of probabilities. Unfortunately, humans tend to be very inefficient in intuitively assessing probabilities (Peterson & Beach, 1967).

## THE AVAILABILITY BIAS

When attempting to judge chances of occurrences, subjective rule-based methods are often employed which enable the individual to reduce complex probabilistic judgments to simpler ones. One such approach to forming subjective probabilities has been called "availability" (Tversky & Kehneman, 1973).

In using this method, a person evaluating the probability of a chance event makes the judgment in terms of the ease with which relevant instances or associations come to mind. Strength of association becomes a surrogate for the judgment of past frequency. In some cases this approach works well since events that happen frequently are often easier to imagine than infrequent ones, and events that happen infrequently may be more difficult to recall than those that happen often. Major errors occur, however, when factors that are unrelated to the frequency of occurrence affect the ease of recalling similar instances.

A study by Tversky and Kahneman (1973) indicates how such errors might occur. Subjects were required to judge whether the letter K was more likely to appear as the first letter of an English word or as the third letter. Despite the fact that K is three times as likely to appear as the third letter, most subjects judged it more likely to appear as the first. When the subjects made their judgment, they tried to bring to mind words that start with the letter K and words that have K as their third letter. It is easier to think of words that start with K, and this acts as a cue on which the subjective judgments can be made. Words beginning with the letter K were, therefore, thought of as more probable than those having K as a third letter. In general, the easier it is to recall instances of an event, the more probable the event is believed.

There appear to exist at least three major mechanisms for aiding in the recall of similar instances or occurrences: recency, salience, and imaginability. Each of the three can operate as a biasing factor by altering the subjective "weight" of past events.

A recent burglary in one's neighborhood acts to distort the beliefs regarding the safety of property in the area. As times passes, however, perceived probabilities of another burglary tend to return toward lower levels. Companies selling alarm systems understand this bias well, promoting their systems to recent burglary victims and their neighbors.

Salient events, such as viewing the bloody aftermath of an auto accident or experiencing the slow death of a loved one from cancer, can also act to increase the subjective judgment regarding future occurrences of the event in question. In these situations the personally dramatic nature of past events acts to dominate judgments of historical frequency.

The ability to imagine a future event also has the power to bias one's probabilistic judgments. The daydreaming high school ballplayer who envisions himself playing third base for the Yankees will likely have a higher regard for his chances in the Majors than a disinterested third party observing his talents from the grandstand. Promotional campaigns of the cosmetics industry are based to a large extent on the ability to induce the imaginability of low probability occurrences. These sources of heightened recall have important implications for understanding gambling behavior. They suggest that realistic perceptions of gaming payoffs are influenced by environmental factors.

The recency factor is important when information is promulgated concerning gaming outcomes. The extent to which positive outcomes are provided to the gambler, for example, total dollars paid out by a slot machine, heighten perceptions concerning the chance of winning. Salience is effected in the gaming environment by dramatic visual and aural stimuli contingent on significant payoffs. This is the mechanism through which the flashing lights and sirens on slot machines and the shouting crowds at craps tables operate to distort perceptions concerning the occurrence of payoffs.

Finally, the imaginability factor becomes important when the payoff situation is personalized. Photographs and stories of winners and what they plan to do with their money provide biasing power by encouraging the gambler to imagine himself in the winner's role.

While experimental research in laboratory setting implies the power of these factors to change behavior in actual settings, considerably more research in the gaming environment seems justified. Specifically, the relationship between the strength of the manipulation and the effect on gaming behavior needs to be specified. While relationships of this type are often curvilinear in form (Higbee, 1969), only empirical research can indicate the true form. Interaction effects must also be investigated along with the possible differential impact on behavior from variables such as stress, individual differences, group influence, type of game, pre-existing knowledge, magnitude of potential payoff and others.

## THE REPRESENTATIVENESS BIAS

The human information processor often improperly attributes characteristics to an entity based on evidence received in a limited setting. This often leads to highly biased representations of an entity's true characteristics. For example,

> Bank presidents are usually surprised when the black suited bank teller absconds with the funds and is found living it up in Tahiti. To the extent that role and situational factors produce behavior that can be labeled as conforming, hostile, thrifty, brave, clean, or reverent, observers are likely to see the individual as being a conforming, hostile, thrifty, brave, clean or reverent person" (Jones & Nisbett, 1971)

This representativeness bias applies to random samples of data. People expect to find a representative relationship between samples drawn from a population and the population itself (Tversky & Kahneman, 1971). When subjects are asked to create a random sequence of imaginary tosses of a coin, they tend to produce sequences where the proportion of heads in a short segment is much closer to .50 than chance would predict (Tune, 1964). Subjects act as if every segment of a random sequence of events must reflect the actual proportion. Further, if a sequence is seen that is different from a known population proportion, a corrective bias in the other direction is expected. Unfortunately, individuals have an erroneous understanding of the process by which future instances combine with previous ones to reflect the true population proportion (Estes, 1964). It is felt that the random process is self-correcting and that errors cancel each other out as more data is

generated. This belief is sometimes called the gambler's fallacy and is incorrect because deviations are in fact not cancelled but diluted by subsequent data.

The erroneous processing of information by means of the representativeness rule just discussed leads to a number of improper judgments.

1. Small samples are highly representative of the populations from which they come (Tune, 1964; Tversky & Kahneman, 1979),
2. Samples that have come from a restricted setting or environment are representative of data that comes from a larger setting or environment (Jones & Nisbett, 1971),
3. Deviations of results from expectations have a causal explanation; i.e., sampling variability does not exist (Tversky & Kahneman, 1971), and
4. Extreme values generated from a purely random sequence will be cancelled by future values (Estes, 1964).

Horse race bettors have long used the strategy of betting on the favorites whenever favorites have been consistently winning in the previous few races. The assumption is that other bettors feel that this is an unusual situation that must be cancelled out by the winning of non-favorites in the near future. If enough other bettors assume that it is less and less likely that another favorite will win, objective probabilities will be distorted, providing the opportunity in a pari-mutual setting for a good bet.

The value of this strategy depends on two factors, the strength of the representative bias and the common knowledge of the strategy. If the bias is not strong enough to produce significant distortions in the odds, the strategy will not be profitable. If the strategy is successful and others know about it, it will be self-defeating as many try the same approach.

The representativeness bias implies that a gambler's perceptions of winning on slot machines, roulette, craps, and other games of chance can be manipulated. For example, the use of shills that win in a highly conspicuous manner can distort the gambler's beliefs concerning the probabilities of success. Also, the belief in causal explanations for random events can aid in encouraging participation in gambling by increasing the perceptions of personal control over the chance outcomes. This can be affected through the use of gambling "systems" for purely random games. Examples of possible situations that may encourage gambling activity through the erroneous belief in the causal connection include the listing of the previous day's winning keno numbers and other such information.

As with the availability biasing mechanism, considerable future research in actual gaming settings is required to create an overall understanding of this effect.

## DISCUSSION AND CONCLUSIONS

The information processing model is a first attempt to provide a framework for analyzing the complexity of factors that affect the gambler's ability to process information. The model is supported, in part, by the clinical work of Ferriolo and Ciminero (1981). The model (Figure 1) illustrates how both individual differences (internal) and situational (external) factors operate to effect the cognitive processing of information relevant to the gambler. Cognitive processing, in turn, can lead to decisions that impact on the duration of gambling activity, the quantity of money wagered, and the satisfaction/dissatisfaction with the gambling experience itself.

Individual differences act to enhance or mollify the power of the availability and representativeness biases. For example, an individual with

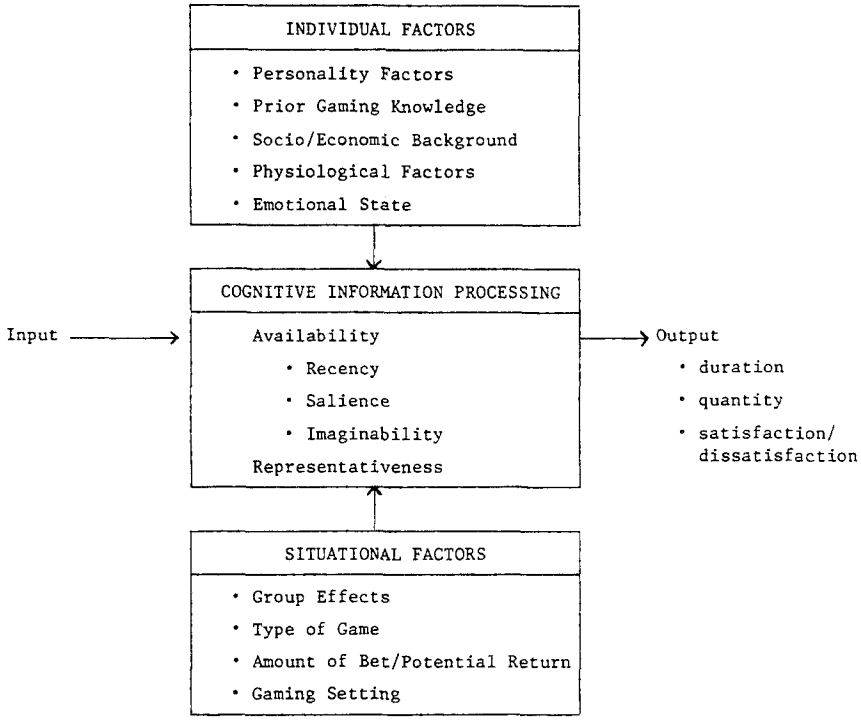


FIGURE 1. Information Processing Biases and Gambling Behavior

low self-esteem may perceive gambling as a means to enhance self-image. This would, in turn, operate to distort the perceived chances of winning through the availability mechanism. Other individual factors such as prior gambling knowledge, socio-economic background, cultural influences and emotional states may also act to influence the ability to properly process information.

Situational or external factors present at the time of gambling can also affect the processing of information. Gambling with a group of friends, for example, may create an intense social interaction such that the salience of cognitions regarding potential payoffs are severely altered. Other situational factors of possible interest include type of game, amount of bet, potential return, and the physical setting where the gambling takes place.

Considerably more research is needed in order to construct a comprehensive list of gambling related factors. This is an essential step toward better understanding information bias processes prevalent in the gambling environment.

Viewing the gambler as an imperfect processor of information has implications for therapy. The initial requirement would be an identification of those factors for the gambler that are critical in biasing information from the gambling situation. Both individual and group sessions, where the gambler is encouraged to talk about perceptions of gambling and of the role of individual and situational factors in the gambling process, would aid in this identification. The inclusion of relatives and friends of the gambler may also prove to be helpful in determining these factors.

Upon identifying the factors that contribute to the gambler's biasing of information, the appropriate therapy program could be constructed. The purpose of the therapy at this point would be to reduce the chance for the information biasing mechanisms to improperly affect judgments of the gambling experience. The gambler would be taught alternative ways of thinking and behaving to effectively cope with the previously identified factors.

If therapy based on information processing biases is to be successful, it must be incorporated into a comprehensive program of treatment. The biasing of information must be viewed as only part of the total psychological disorder facing the compulsive gambler.

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