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PRINCIPLES OF AN OPTIMAL MATHEMATICAL INTERVENTION IN PSYCHOLOGY OF NEAR-MISS IN PROBLEMATIC GAMBLING: TYPES AND EFFECTS

[1]Sumit Geahlan, Asstt.

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Abstract

The near-miss phenomenon has been a significant focus of research in the problem-gambling industry, with studies exploring its causes and effects. However, there has been less focus on the near-miss as a gaming phenomenon itself, particularly on the fallacious elements of the near-miss cognitive effects and the inadequate interpretation and representation of the elementary mathematical definition of the classical near-miss. This paper aims to address this gap by providing an optimal mathematical intervention in the psychology of near-miss in problematic gambling.

The paper argues that the unique features of games of chance, such as the pre-manipulation of award symbols to maximize the frequency of engineered near-misses, have contributed to the misunderstanding of the near-miss phenomenon. The study seeks to investigate how probabilistic reasoning occurs in exploratory learning conditions that are random in nature. The emphasis is on what learners with little knowledge of formal probability theories can do when coping with compound random circumstances in which opponents are offered to implement various probabilistic lines of reasoning. The research indicates that probabilistic reasoning takes shape through a contextualization mechanism, where cognitive behavior oscillates between contextual perceptions and reflections, the focal event, and new knowledge that comes into play. Students are shown to be able to formulate ideas of an underlying distribution of probability in the case of compound random phenomena before instruction. Geometrical and numerical considerations, as well as statements representing the concepts of the rule of large numbers, are discussed by the students.

[1] Professor of Mathematics, I.B. (PG) College, Panipat, India

INTRODUCTION

The near-miss has received great attention in problem-gambling research as a complex game-related factor that affects problematic gambling activity. Such uncertainty remains in the potential of the near-miss, even in losing conditions, to create psychologically satisfying experiences. Due to the influence of the now paradigmatic "I was so close," the immediate effects of these encounters are the suspense, excitement, thrill, and a decision to continue the gambling operation at the same or higher intensity. In particular, the near-miss is a kind of intermediate reinforce in the form of a motivating sign; distinct from the continuous rewarding experiences of a gambler in his/her reinfection. Early studies have shown that when they either win or nearly win, gamblers become physiologically aroused; other studies have shown a clear cognitive bias characterising the psychological factors that trigger recurrent gambling, and near-miss encounters have their own such bias.

A near-miss can have the same conditioning effect on action as performance, the psychology of the near-miss came into focus with the work, becoming a highly reinforcing factor (at no extra cost to the owner of the machine). As such as a cognitive conditioning, a near-miss could generate some of the excitement of a win. Near-miss actions can be explained in terms of the theory of anger or cognitive regret. A recent analysis on scratchcard players found that players perceived near-misses as negatively balanced and disappointing defeats, but after this form of result, they moved more quickly to the next game.

The idea of a near-miss as a failure that is close to being successful," which in the conceptual structures of contemporary research has been carried over literally, without refinement. The topic of the current paper is this. Nevertheless, with the growth of the games especially slots, differences have been made regarding the kinds of near-misses. Therefore, we differentiate between two kinds of near-misses: a direct near-miss (associated only with the resulting series or mix of numbers, symbols, cards, etc of the game-e.g., what occurs in slots on a payline), and an indirect near-miss (associated with the region game shows along with the result-e.g., what appears in slots adjacently above or below the payline). The latter type of near-miss is peculiar to modern slot games and some scratch cards and is seen as a structural characteristic of these games. For virtual reel mapping, manufacturers use a technique called 'award symbol ratio' to create a large number of illusory near-misses above and below the payline in slots with virtual reels. The direct effect of this approach is the rise in the incidence near the paylines of so-called nearmisses. Initially, the influence of the indirect near-miss on the player is supported by the impression that the player gained some insight into the machine's functionality (since it can see more on the monitor than the machine's outcome, including an illusory movement of the reels and implicitly a false chronology). In the work of, the functionality of such techniques was studied in depth as to their mathematical, ethical and legal aspects and their causal connection with the skewed cognitions of the player.

THE ORIGINS OF PROBABILITY

It took several centuries for the journey from mere intuition of uncertainty to its calculation. The birth of probability as the measurement of chance events and thus the probability calculus can be dated to 1654, when Blaise Pascal provided Fermat with the solution to two problems as to how to fairly divide the stakes in the event of an interruption of a game of chance.

The opening words of Poisson's Recherches (1837), one of the greatest mathematicians of the early eighteenth century, are famous: "The origin of the calculus of probabilities was a problem of games of chance proposed to an austere Jansenist by a man of the world." It is said that a certain Chevalier de Mer'e wrote a letter to Blaise Pascal in about 1650 in which he posed two mathematical questions connected with games of chance to the famous logician. He asked in the first one if it was more likely to obtain at least one six times by rolling a die four times or to obtain a double six times by throwing two twenty-four times. He posed a much more complicated question in the second: how should the stakes be divided equally in a game that is won by achieving a fixed score if the game is interrupted before the end? These were questions that had already been discussed for a long time with solutions that were not always correct, but that were already trying to use combinatory to build the space of possibilities.

Mr. Antoine Gomboaud, a wise, honest man, a master of fine manners and the author of virtuous books under that pseudonym, was Chevalier de Mer's real name. He was by no means a frequenter of the dens of gambling; nor was he a strict Jansenist, Pascal, who led a secluded life. His reply to the letter was not intended to win matches or share stakes. On the contrary, its aim was to learn in a new way to reason.

After a long exchange of letters with Fermat, Pascal's solution came and paved the way for the establishment of the theory of probability. Around the same time, other authors, almost as if to bear witness to the need for this new vocabulary, arrived at similar solutions to different problems. It is a language that revolutionised logic as much as mathematics did, and one that provided an array of extraordinary instruments for modern science.

The stage was set, and the greatest philosophers of the period working from different hypotheses and using different languages, succeeded in laying the foundations of probability theory in the space of a few decades and contributed to the many meanings that the word "probability" has today. The seventeenth century alone produced to name but a few Leibniz, Huygens, de Witt, Wilkins, Arbuthnot, Fermat, Halley, Hobbes, Petty, and many other lesser-known figures whose work led to the flowering of the giants of probabilistic reasoning in the following centuries: first and foremost the Bernoullis, followed by Bayes with his famous theorem that provided a probabilistic solution to the probabilistic solution.

PROBABILISTIC AND STATISTICAL MODELS AND FUNCTIONAL MODELS

In applied mathematics, games of chance and gambling as a quantifiable operation are described by specific mathematical models in applied mathematics that can be differentiated by two key categories regarding the purposes they serve, which I call:

1. Models of probabilistic and statistics
2. Functional trends

Although probabilistic and statistical models work under conditions of uncertainty for applications related to the results of games, functional models serve to serve as functional models.

The physical structures and processes that actually make the games work as well as the functioning-related applications are depicted. For example, it is possible to measure the likelihood of reaching a certain number or at least a certain amount of winning numbers in a particular lottery within a particular lottery.

Probabilistic model, which assumes that the correct probability field is defined within which to operate with the required discrete distribution of probability Within a statistical model, computing statistical means and errors (in the statistical sense) is workable by evaluating the distribution of the random variable that defines the outcome and using mathematical means and measures such as expected value, deviation, dispersion, or variance. The movement of cards in poker is defined through a functional model dealing with card-specific combinations of symbols and values. In a functional model, Roulette complex bets are described as elements of a mathematical structure with Vectorial and topological characteristics. A multiline slot machine's paylines are represented as lines in a Cartesian grid or paths in a graph, and topological properties define their mutual independence, all of which are still within a functional model.

1. **Models of probabilistic and statistics Purposes:** game uncertainty quantification, probability and possibility estimation, prediction, assessment of game characterization parameters, means and statistical errors,

delivery of realistic statistics (data collection), optimization, strategy delivery and optimal play. Governing theories: theory of estimation, theory of probability, statistical statistics, real study, theory of decision.

2. **Models Functional Purposes:** definition of the gaming processes and the functioning of the games, optimization, strategy delivery and optimal play, providing the theoretical support required for the probabilistic and statistical models. Set theory, combinatory, number theory, algebra, topology, geometry, graph theory, real analysis: governing theories.

PREVALENCE OF THE PROBABILISTIC AND STATISTICAL MODELS

In the interest of all parties involved in the gambling analysis, researchers, game producers and operators, and players, there is a prevalence of first category models. This prevalence can first be explained by the fact that these models provide the financial outcomes of gambling activities with measurements, projections and predictions, which in turn produce the most significant indicators for the commercial aspect of the phenomenon. In reality, these models offer a mathematical "guarantee" to game manufacturers and operators that a certain game can be run in the long run without the possibility of ruin for the house; the most important mathematical parameters in making gaming decisions are for teams, probabilities and statistical indicators. Second, games of opportunity have easy working systems. For commercial purposes, with simple sets of rules and short timeframes of sessions, they are designed to be as undemanding as possible; according to this uncomplicated nature, the functional models representing them are typically simple, often trivial (unlike other types of games, such as strategy games such as chess, whose complexity is modelled by richer mathematical modes There are also exceptions to this concept of functional-model-simplicity, i.e. games whose seemingly simple operation conceals complex mathematical models. In roulette betting, where complex bets are reflected, this is the case.

As elements of a mathematical framework, creating Vectorial and topological spaces and equivalence classes within which it is possible to create different further applications. This exception also applies to multiline slots, where probability applications relating to payline groups rely on a display representation as part of a discrete mathematical structure

(Cartesian grid or graph) generating a metric space (and implicitly a topology) within which the probabilistic models (Barbb) serve to define properties such as relation, neighbourhood, and independence.

MATHEMATICAL KNOWLEDGE AND EPISTEMIC KNOWLEDGE

The key functions of a mathematical model in the physical sciences, including description, optimization, calculation, approximation, or simulation, are representation and interpretation, along with prediction, and those roles also relate to gaming and gambling science. The primary means of inference in science is mathematical modelling, and modern to modern accounts of the role of mathematics in the scientific explanation of physical phenomena have argued for its indispensability. It is possible to infer from mathematical models, which is the central tool of scientific reasoning, first because mathematics is a rich source of structures, and secondly because of the mathematical model's representational function, which makes it possible to consider mathematical structures as embedded in the physical world. This inference works in three stages (immersion, derivation and interpretation), where the first and third stages presume that mappings from the empirical configuration are generated.

In terms of inferential conception of mathematical modelling, an extension of the mapping account, to a convenient mathematical framework. The mapping account establishes isomorphic or homomorphic connections6 between mathematical structures recognised in the idealised physical system from within a mathematical theory and mathematical structures. The inference based on the mathematical model is epistemologically justified by this iso/homo-morphic function of the mapping account. Applied mathematics is the object of the realistic execution of the three steps above and the setup of the mappings from steps 1 and 3 is called mathematical modelling.

GAMBLING-MATHEMATICS KNOWLEDGE AND RELATED EPISTEMIC KNOWLEDGE

Within and around the mathematical models of games and gambling, the structure of gambling-mathematics knowledge can be described entirely, since all the Gambling-related mathematical behavior, facts, and knowledge are derived exclusively from these models.

First, formal systems, propositions, and theorems contain mathematical (governing) theories or parts of them directly addressed to gambling (that the models use in the derivation step), and the logical flow between them yields the theoretical results of any application of gambling-mathematics. All this theoretical knowledge is pure knowledge of mathematics, which can be accessed and handled by gamblers with a high level of mathematical education.

Second, the general applications that define the basic theoretical framework and restrict the mathematical theories in part to the modelling needs of each game (the Theoretical support for what we generally call roulette, blackjack, poker mathematics, and so on) is included in the knowledge of applied mathematics, still theoretical, and still accessible and manageable by gamblers with a level of mathematical education lower than, but still high pure math.

Finally, the results of unique practical applications for each game or any quantifiable gambling operation, obtained through specifications of general applications and computations, yielding practical and numerical results such as game parameters, approximations, odds, statistical indicators, optimization directions and recommendations, are still within the knowledge of applied mathematics.

Gamblers may acquire this pure and applied knowledge of gambling mathematics (hereinafter abbreviated as PAGMK) through educational means (gambling-mathematics courses in schools or private organizations, experimental interventions) or unique media interventions (books, journals, magazines, and websites). The structure and content of such gambling-mathematics tools differ, of course, and current courses generally follow the curricula of standard Introduction to/Basics of Probability and Statistics classes in postsecondary schools, concentrating on the applications of these gambling disciplines. With regard to the latter category of tools, the multitude of popular literature published in the last two decades on gambling mathematics increases the need for critical selection and professional certification when it comes to a recommendation.

MATHEMATICAL EDUCATION IN PROBLEM GAMBLING

Past research on the effect of a mathematical didactic intervention on gamblers has largely been observational, examining whether learning about gambling mathematics affects gambling behaviour. With regard to the teaching module, the experimental setup of those studies was of two kinds, either assimilated with regular Probability Theory & Mathematical Statistics courses taught in secondary and post-secondary schools, but containing more games of chance implementations, or planned and taught outside the curriculum. Introduction to and Fundamentals of Probability and Statistics covered the material of most of the teaching modules, covering definition and probability properties, basics of descriptive and inferential statistics, discrete random variables, expected value, classical distributions of probability, and central limit theorem. The modules were filled with examples and applications from chance games and had lessons devoted to mathematically demystifying common gambling fallacies.

Both types of studies have produced inconsistent, non-conclusive findings, and many of them have surprisingly tended to answer no to the hypothesis that after the intervention, gamblers obtaining such unique mathematical education display a substantial improvement in gambling activity. It is found that only nine of the studies sought to quantify intervention effects on behavioural outcomes in their systematic analysis of empirically evaluated, school-based gambling education programmes (20 articles and 19 studies), and only five of those reported substantial improvements in gambling activity. Of these five, methodological inadequacies have been frequently reported, including Brief follow-up times, lack of comparison of regulation in post hoc studies, and gambling activity assessment anomalies and misclassifications. Two key issues arise in addition to any discussion of the validity and adequacy of the experimental setup of these studies relating to the sampling, evaluation and testing of hypotheses (which can provide a partial reason for the conflicting results):

- With respect to the intended impact of restricting excessive gambling, what mathematical information will an optimal teaching module contain? In other words, in the present didactic initiatives, what is missing?
- How relevant is the gambler's previous mathematical history in achieving the intended effect? In other words, even if the teaching module's content and structure are optimal, is it sufficient for the student to understand and assimilate the presented mathematical facts, or is mathematical thinking required, not only computational but also logical inquiry and highly analytical thinking that can only be done through long-term previous mathematical education and experience?

To date, the contribution of mathematics to therapeutic intervention in problem gambling has been limited by conventional mathematical expertise to facing the odds and correcting standard misconceptions.

CONCLUSION

I have made a structural analysis of the mathematical and epistemic information available to gamblers in this paper, as attached to the mathematical models of games of opportunity and the act of modelling. I have placed two categories of these models into evidence and have shown that only one of these two has gained attention from researchers in problem gambling. I argued that taking functional models and functional models into consideration In terms of restricting excessive gambling, epistemic information attached to gambling mathematics will allow for the potential of such knowledge in both didactic and clinical cognitive interventions.

In order to determine the following, further study is required, both theoretical and empirical, in different directions:

- If the presented learning concepts are actually applicable, either didactically or clinically, to gamblers;
- What the ideal content and function of teaching modules and modules of therapists, strengthened by those concepts, will be;
- Whether the potential of this non-standard information would eventually manifest itself, given the different levels of gamblers' education;
- If it is possible to reduce such information to alert messages, and how such warning messages vary from warning messages specific to other addictions.

From its very beginning, problem gambling research has concentrated on the individual's biological/psychological make-up, and this is explainable at least partly by the fact that this field consists predominantly of medical doctors and psychologists. By appealing to the unexploited potential of mathematics, the proposed research transfers the emphasis to the games themselves. Provided that gambling is a dynamic area that not only includes gamblers, but also gamblers it is inevitable that interdisciplinary research using the complete and direct contribution of mathematics is linked to the gaming world.

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