

The Psycho-Structural Cybernetic Model, Feedback, and Problem Gambling: A New Theoretical Approach

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The majority of etiological models of problem gambling fail to address various elements leading to this maladaptive behaviour pattern, despite recognizing that a multitude of factors contribute to its development and maintenance. Models focus either on the individual (agentic) or on the structural level of analysis. Consequently, most models inherently fall prey to reductionism. This bi-polarity of models has led to the search for a more wide-ranging method. This article describes *fourth-order cybernetic theory*, a comprehensive and alternative approach to address the problems inherent in earlier etiological models of problem gambling. Cybernetics, a feedback system, displays great potential in addressing the complex interactions between the agentic and structural levels that lead to problem gambling and its maintenance.

Keywords: Fourth-order cybernetic theory; Psycho-structural cybernetic model; Problem gambling; Negative feedback; Positive feedback.

Cybernetic Background

Most etiological models of problem gambling fail to properly address the vast multitude of causes that lead to this maladaptive behaviour pattern. Specifically, because they strictly focus either on the individual (agentic) or on the structural levels of analysis, these models are naively reductionistic. Fortunately, an alternative exists in the form of *cybernetic models* (see [Table 1](#) for a summary of the various cybernetic models). These models propose a feedback system that can better account for the various interactions between the agentic and structural levels in leading to the establishment and maintenance of problem gambling.

First-order cybernetics, which originated from an engineering approach, stressed the importance of clearly defining the boundaries of the system under study. The main focus of this model was on control systems and homeostasis; therefore, it only considered negative

feedback loops. All observers were considered to be equal, and were thus able to provide an “objective” truth of the system being studied. As a result, first-order cybernetic theory proposed a *positivist approach* (see [Table 2](#)).

Second-order cybernetics, drawing on the functionalist-constructivist approach, rejected the “objective” positivist view and recognized that social phenomena could not be depicted adequately through linear, cause-and-effect approaches ([Spink & Saracevic, 1998](#)). This model focused on positive feedback loops and on morphogenesis (i.e., change).

Third-order cybernetics, building on social constructivism, held that behavioural systems are fragmented across, and shaped by, different social contexts. Further, third-order cybernetics ascribed to circular causality, suggesting that, in a *top-down* fashion, individuals are shaped by the internalization of the dominant culture; in a *bottom-up* direction, the dominant discourse is reproduced and transformed through local interactions ([Dallos & Urry, 1998](#)).

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Table 1
Summary of the Different Cybernetic Models

	Orientation and Approach	Focus	Feedback	Important Contributions
First-order cybernetics	Engineering, technological	Homeostasis	Negative feedback; Circular causality	1. Definition of boundaries 2. Subsystems and supra-systems
Second-order cybernetics	Functionalism-constructivist	Morphogenesis	Positive and negative feedback	1. Observer as an important part of system 2. No “ultimate” perspective 3. Self-reference; self-production
Third-order cybernetics	Social-constructivist	Top-down and bottom-up circular causality; Morphogenesis	Positive and negative feedback	Emphasis on the meanings of interactions
Fourth-order cybernetics	Multiple realities; Post-modern	Agent-structure interactions	Positive and negative feedback	1. Asymmetric power relations 2. More focus on positive feedback

Fourth-Order Cybernetics: An Integrated Theory

In developing a new version of cybernetics (i.e., *fourth-order cybernetic theory*; Zangeneh & Haydon, 2003), an attempt was made to address some, if not all, of the shortcomings of previous versions. What is presented here is by no means final and complete—rather, it is a promising first step for a theory in progress. The main purposes of developing a new version of cybernetics were: (a) to introduce a paradigm shift; (b) to address an explicit discussion of the human system, including problem gambling; and (c) to develop a model to demonstrate how structure and context influence such systems. Central to this effort is the application of a unique, critical theory inspired by the works of Anthony Giddens (1971, 1990; see discussion on modernity and reflexivity) and John Francois Lyotard (1979; see discussion on post-modernity) to the cybernetic theoretical framework. The epistemo-

logical orientation of the theory proposed here is that of multiple realities shaped by social, cultural, economic, ethnic, gender and disability values, which centralize on the asymmetric power relations in society (see Figure 1).

Psycho-Structural Cybernetic Model

Psycho-structural cybernetics is a model derived from the fourth-order cybernetic theory (Zangeneh & Haydon, 2003). In this model, the basic units of a human system are the agent and the structure (see Figure 2).

These two components provide feedback to one another and influence one another's activities. Within the agent component, both biological and psychological factors have an impact. Information and activities that are contained within the agent have the ability to interact with the structure through the more general agent-structure loop (see Figure 2). The structural component includes elements such as culture, broadcast

Table 2
Summary of Paradigms

	Positivist Paradigm	Interpretive/Constructivist Paradigm	Critical Paradigm
Ontology	One reality exists; Reality is knowable within probability	Multiple, socially-constructed realities	Multiple realities shaped by social, cultural, ethnic, economic, political, gender, and disability doctrine
Epistemology	Objectivity is vital; Researcher influences and observes in detached, objective manner	Reciprocal link between researcher and participants; Values are made explicit	Reciprocal link between researcher and participants; Knowledge is socially and historically positioned

agents, economical disparity, political and public health policy, and community structure.

In the basic figure of the human system, feedback occurs between the two integral components (agent and structure). To some extent, feedback in any system or in any system component is negative, or deviation-reducing. Systems tend toward organization (by direction or by choice); therefore, systems necessarily have homeostatic loops. There are, on the other hand, situations wherein systems must change (i.e., positive feedback). First-order cybernetics did not address the need for change in systems, and therefore included only homeostatic, negative feedback loops. In second-order cybernetics, the importance of positive feedback was first suggested, but not thoroughly discussed; the discussion of feedback is altogether absent in the third-order model.

In the psycho-structural cybernetic model, not only are both feedback systems discussed as relevant to problem gambling behaviour, but more attention is also paid to potential positive feedback loops. These positive feedback loops are usually dormant or controlled. When the system encounters a context or situation that causes “discomfort” or “problematic” input, the positive feedback loop is activated until a more “comfortable” state is attained. The positive feedback process does not have a set goal point, yet functions to introduce a change in the system; such feedback will continue until the system is adjusted. Once the changes have been instituted, a new standard of comparison is used by the negative feedback loop, and homeostasis is restored (see Figure 3). The feed-

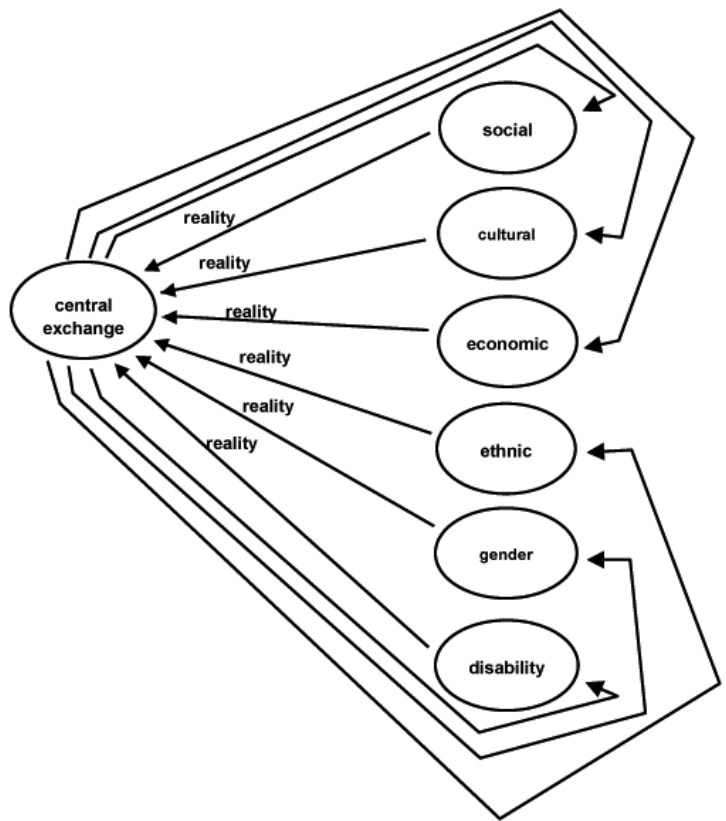


Figure 1. Epistemological orientation of the psycho-structural cybernetic theory.

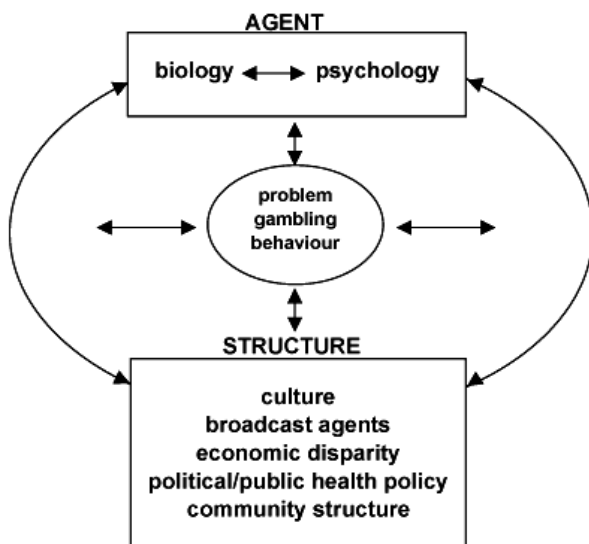


Figure 2. Interactions between the agentic and structural factors in producing and maintaining problem-gambling behaviours.

back loops are very adaptive and are able to function even when input and comparison values are altered.

It is possible, however, that change is not necessarily constructive, and that the positive feedback loops can continue operating in a maladaptive fashion. If the positive feedback loop does not return to a resting position after the required changes have occurred, the system will continue into a maladaptive spiral, thereby creating further deviation-increasing behaviours (see Figure 3). Such a failure of the positive feedback loop to return to a resting state following the institution of required changes is one explanation of maladaptive behaviours in human systems. Another possibility for the malfunctioning of the feedback loop, positive or negative, is *misregulation*. If the system has an inappropriate higher-order reference point in the comparator function (test using higher reference point) of the feedback loop, behaviours inappropriate for the system may be encouraged and subsequently performed. In this scenario, the feedback loop operates in a normal fashion, but is producing incorrect behaviours and is issuing incorrect commands. It is also possible that the input function of the feedback loop is not functioning in a constructive and functional way. If the system fails to

correctly recognize input regarding the environment and its own functioning, any behaviour that it produces will be maladaptive.

Problem Gambling as a Result of Negative Feedback

Negative feedback could lead to a problem behaviour (see Figure 3) when a comparator uses faulty or irrelevant incoming information, consequently producing erroneous behavioural output. On an agentic level, a consequence of a comparator employing faulty information may be the *gambler's fallacy*: The belief that the probability of winning is increased after several consecutive losses. The gambler's fallacy likely underlies a gambling behaviour termed *chasing* (Turner, Zangeneh, Toneatto, Spence, & Liu, 2003).

Another instance wherein a comparator employs faulty information may occur when gamblers firmly believe in their ability to control the outcome of a game of chance. Although most individuals recognize that games such as roulette, slot machines, and lotteries are games of chance, gamblers usually develop strategies, have confidence in their skill, and believe their tactics will have an impact on the outcome of the game (Ladouceur, Dube, Giroux, Legendre, & Gaudet, 1995). According to Ladouceur and Gaboury (1988), many of these individuals attribute their success to personal factors, such as skill, while attributing their losses to external factors, such as bad luck. Walker (1992) also suggested that problem gambling is maintained by irrational thinking; he identifies two aspects of irrational thought: (a) illusion of control, and (b) belief in luck.

According to Turner (2000), early wins lead to misconceptions about randomness, which promote distorted expectations in games of chance. Problem gamblers may misinterpret wins or losses in a manner that affects future negative feedback loop functioning, resulting in feedback dysfunction.

Furthermore, gamblers who are superstitious tend to report that they have control over their luck. According to Toneatto (1999, p. 1597), "cognitive superstitions include beliefs that certain mental states can influence the probability of winning." Superstitions of this sort can include hope, prayer, positive expectations and attitudes, and a strong belief that winning is imminent (King, 1990; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997).

On a structural level, similar use of faulty or irrelevant information may also be observed. According to Cornish (as cited in Vance, 1989), some individuals have a greater tendency than others to be influenced by promotions, thereby being rendered helpless when faced with an onslaught of advertising. In addition, the prizes offered, the low ticket price for games of chance (e.g., lottery), and the odds of winning are among the

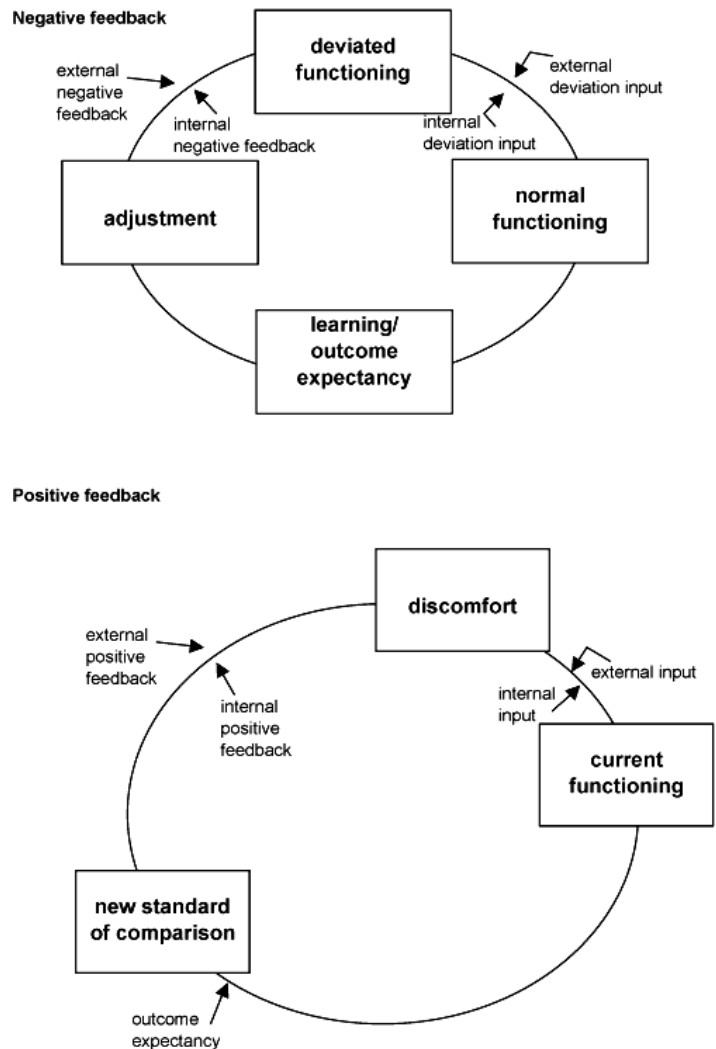


Figure 3. Negative and positive feedback loops.

powerful incentives that, when combined with clever advertising campaigns, further the prevalence of chance ideology in suggesting tendencies in vulnerable individuals (Vance, 1989).

Treating gambling as "just harmless fun" captures yet another area of our lives for exploitation by commercial interests. As noted by Politzer, Yesalis, and Hudak (1992, p. 23), "institutional leisure has reduced our opportunities for genuine creative play... contemporary people are perpetually bored, dissatisfied, and looking for safe risks." When these risks are made available through government-licensed corporate interests, public policy becomes complicit in feeding widespread cultural dissatisfaction. Specifically, such actions stimulate both the opportunity and the desire to gamble by increasing the prevalence of these commer-

cialized forms of “risky” entertainment in society. The structural component of the system is therefore providing the problem gambler with possibly faulty and ambiguous information.

Racetracks market a certain “mystique” about horseracing and horserace gambling, having been associated with the glorious pasts of the wealthy upper classes who would assemble to watch horses race hundreds of years ago. Gambling enterprises market casinos as vacation destinations for those who would otherwise not have opportunities to be pampered and surrounded by wealth. Casinos also employ incentives, including free drinks and VIP service, to attract customers (Eade & Eade, 1997). The payouts of the casino are sometimes advertised in order to attract those who wish to test the odds; however, individuals tend to interpret such figures as indicative of a high likelihood of winning. Other incentives, including musical productions, promotions and special sporting events, are also important in luring players (Eade & Eade, 1997).

Most international studies on lottery play have revealed that the working class sector of the population is overrepresented (Clotfelter & Cook, 1987). Since television-viewing is more prevalent in the working class sector, the impact of television-based marketing of lottery gambling may be heightened for this group. Furthermore, a televised draw (which happens in nearly all countries) highlights the perceived simplicity of winning while simultaneously neglecting to portray the immense number viewers who have lost (Walker, 1992).

The financial viability of the gambling industry is a powerful incentive for commercial operators to re-frame attitudes in a bid for true social legitimacy. Tactics employed for public persuasion by pro-gambling forces, according to Preston et al. (1998), include *stigma neutralization* (e.g., “Gambling is good!”), to put it crudely), *exceptionalizing* (e.g., “This isn’t gambling, it’s family entertainment!”), and *excusing* (e.g., “gambling will serve economic needs”). For instance, the argument for legalizing or expanding gambling may be framed in terms of a special gambling initiative dedicated to a noble purpose, such as senior citizen aid, funding of cancer programs, support for the arts, or revitalization of a city’s troubled economy. These supposedly positive purposes mislead vulnerable individuals, resulting in possible consequent psychosocial troubles and financial bankruptcy.

Problem Gambling as a Result of Positive Feedback

Positive feedback can lead to behavioural problems when our cognitive, behavioural, emotional, and/or biological systems encounter discomfort or uncertainty (see Figure 3). In reaction, we display behaviours to alleviate such discomfort (e.g., engaging in dissonance

reduction). These behaviours, in turn, trigger positive feedback and increase the behaviour that preceded the discomfort (e.g., winning). If positive feedback continues to reproduce such behaviour instead of establishing a new standard for comparison, we will then behave and operate in a maladaptive fashion.

On an agentic level, early wins can act as a precursor for the development of problem gambling (Custer & Milt, 1985, cited in Conventry & Norman, 1998; Moran, 1970; Shubin, 1977). These early wins usually result in distorted expectations. Relevant to this idea, Tversky and Kahneman (1990) discuss the concept of *heuristics*. The two main heuristics described by Tversky and Kahneman (1990) are the availability heuristic and the representativeness heuristic. The *availability heuristic* is used to evaluate the probability of an event on the basis of the ease with which instances or occurrences of the event can be brought to mind. The *representativeness heuristic* is used to evaluate probability of an event *A* occurring using the degree to which *A* resembles *B* and a knowledge of the approximate probability of *B*. The representativeness heuristic is essentially the belief in small numbers—the belief that global properties will be reflected in local series, which leads to the gambler’s fallacy. The gambler’s fallacy likely underlies *chasing*, which occurs when players bet increasingly larger amounts to win back what they have lost. That is, gamblers assume that a series of losses will be followed by a win, and if they increase their bet after each loss (i.e., they chase), then a win will recoup the amount they have lost (Stripe, 1994). Turner (1998) found that chasing is successful 99% of the time; individuals may therefore come to believe that this strategy is infallible, and will consequently gamble despite severe monetary losses. Once a small win or a near win has occurred, biased evaluation (e.g., biased attribution) of the outcome will maintain the illusion, as the gambler may conclude that, with diligence and persistence, a big win is inevitable (Walker, 1992). Consequently, the player continues to gambling believing that he or she will eventually regain his or her losses. This continued placing of bets may eventually become uncontrollable; such an escalation of play represents an uncontrolled positive feedback loop. Change is not occurring in a regular fashion; rather, the problem gambler cannot stop the positive feedback loop, or the morphogenesis, of his or her gambling behaviours.

On the structural level, powerful media further encourage positive feedback. For example, the most important aspect of the success of gambling in Canada is the dissemination of *chance ideology*, which consists of illusions of equal opportunity of personal success that are spread through the public through images in advertising (Zangeneh, Suissa, Reed, & Haydon, in 2003). This ideology is more highly valued by lower-income members of society because, as a result of their limited

material means, they grasp onto any hope that may lead them to achieving their dreams of riches. Chance ideology is also highly valued by the middle-income earning class because of the illusive hope of reaching the threshold to wealth and achieving control over one's fate (Zangeneh, Griffiths, Reed, & Diakalokous, 2003).

The role of positive feedback may also be observed when marginalization acts as a vehicle and a precursor to the development of problem gambling. Certainly, the appeal of gambling to marginalized or socially-restricted groups is, in part, that gambling (a) is an easily available source of pleasure and excitement; (b) that it provides a reinforcing sub-cultural sense of belonging; or (c) both. Consequently, gambling may be one of a constellation of coping behaviours employed by marginalized groups.

Gambling, as an institution, has its own social rewards, including membership in a gambling subculture. Gambling provides newcomers with new peers, a

(Bloch, 1951; Ocean & Smith, 1993). In some contexts, particularly in the popular casino environments, gambling may allow the player to take on an exciting new social role—that of the adventurous high-roller, who is accorded respect by others within the gambling environment.

Concluding Remarks

Problem gambling, like any other human behaviour, is a complex phenomenon that results as a consequence of the interaction between agentic and structural levels of analysis. Models focus either on the individual (agent) or on the structural level of analysis (see Figure 4). The psychological approach focuses on individuals' internal processes (e.g., intentions or motivations), while the structure-centred approach focuses on social processes (e.g., organizational dynamics) in explaining social knowledge. This dichotomization of focus reflects a long-standing disagreement over whether social knowledge and its history are products of the action of individuals or of social processes that operate rather independently of individual freedom. The way the notion of individual and structure is perceived, in turn, would shape one's empirical and broader historical perspectives. Social knowledge, according to the fourth-order cybernetic theory, is neither a collection of individual actions nor a set of social structures. Instead, social knowledge is a process with *psychological* and *structural* aspects that can be learned by individuals and that can become incorporated into their behaviour. This process, in turn, changes the social knowledge's condition of validity. Thus, individual behaviour neither passively adapts to structural dynamics nor is it solely goal-oriented (Anderson, 1980). Rather, individual behaviour involves practical knowledge of one's world, and the ability to reflect upon the conditions of one's actions.

The proposed theory and the associated model are part of a conceptual and empirical framework that attempts to integrate various levels of knowledge that offer a novel approach to understanding complex human behaviour. What is presented here is by no means final or complete; it is a promising first step for a theory and a model in progress, and is open to theoretical and empirical scrutiny.

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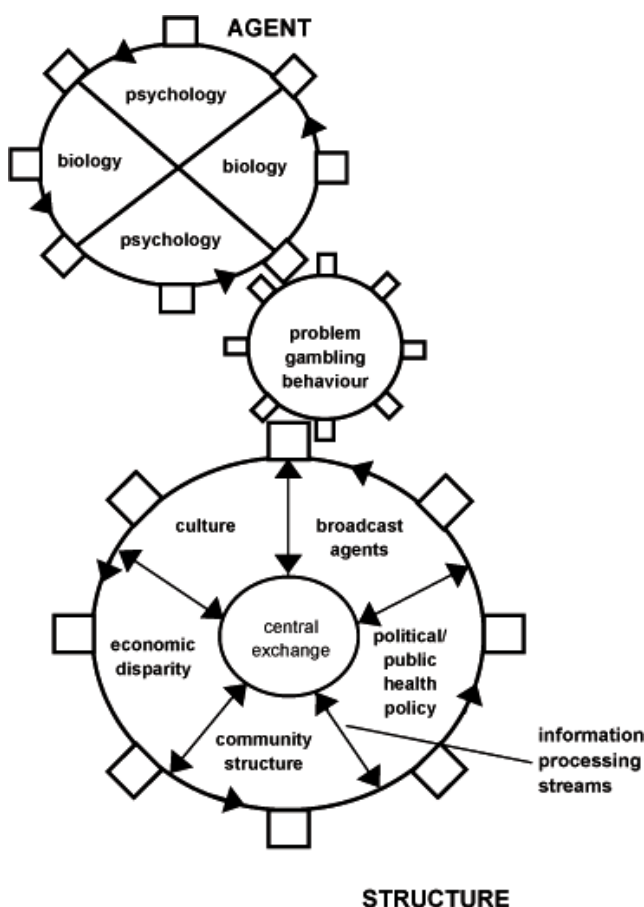


Figure 4. Agentic and structural levels of analysis.

social purpose, an identity, and a private language

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