Analysis of Gambling Behavior

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The Analysis of Gambling Behavior (AGB) is a peer-reviewed publication that contains original general interest and discipline specific articles related to the scientific study of gambling.

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**Content of the Analysis of Gambling Behavior**

The Analysis of Gambling Behavior (AGB) contains general interest and discipline specific articles related to the scientific study of gambling. Articles appropriate for the journal include a) full-length research articles, b) research reports, c) clinical demonstrations, d) technical articles, and e) book reviews. Each category is detailed below along with submission guidelines:

**Research Articles** – a manuscript of full length (20-30 double-spaced pages approximately), which may contain multiple experiments, and are original contributions to the published literature on gambling.

**Research Reports** – a manuscript of reduced length (no more than 10 double-spaced pages and a single figure or table page), which may be less experimentally rigorous than a Research Article, a replication of or failure to replicate a prior published article, or pilot data that demonstrates a clear relationship between independent and dependent variable(s). The Results and Discussion sections of Reports should be combined.

**Clinical Demonstrations** – a manuscript of reduced length (no more than 8 double-spaced pages and a single figure or table page) which lack the rigor of a true experimental design, yet do demonstrate behavior change of persons with gambling disorders under clinical care. This manuscript should contain an Introduction, Methods/Treatments, Results, and Discussion sections. The Results and Discussion sections of Clinical Demonstrations should be combined.

**Technical Article** – a manuscript of either full or reduced length, depending on necessity, that describes either a new technology available that would be of interest to researchers or a task-analysis style description of how to utilize existing technology for the conducting of research. Examples of appropriate topics may include, but are not limited to, the rewiring of a slot machine for the collection of data or controlling of win/losses, how to use computer software to simulate a casino game, or the way in which neuroimaging devices may interfaced with an experimental apparatus.

**Book Review** – a review of a contemporary book related to gambling not more than three years after the publication data of the book to be reviewed. The review should be no more than 15 doubled-spaced pages in length.
ANALYSIS OF GAMBLING BEHAVIOR

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Contents

Dixon, M.R. Why behavior analysts should study gambling behavior 1

Discussion Article
Weatherly, J.N., and Dixon, M.R. Toward an integrative behavioral model of gambling 4

Commentaries
Dymond, S., and Whelan, R. Verbal Relations and the behavior analysis of gambling 19
Cooper. A. Delay Discounting and problem gambling 21
Lyons, C.A. Getting there: Commentary on “Toward an Integrative behavioral model of gambling” by Weatherly and Dixon 23
Petry, N.M., Madden, G.J., and Roll, J.M. The alloplastic nature of pathological gambling 25
Reilly, M.P., and Fox, A.T. Integrative model or fracturing framework: Better we hedge our bets 27

In Response
Dixon, M.R., and Weatherly, J.N. An integrative, not necessarily comprehensive, behavioral model of gambling 30

Research Article
Weatherly, J.N., Austin, D.P., and Farwell K. The role of “experience” when people gamble on three different video-poker games 34

Research Report

Clinical Demonstration
Arntzen, E., and Stensvold, J. Treatment of compulsive gambling 50

Technical Article
Jackson, J.W. Using WinPoker 6.0 to study gambling behavior 59

In Memoriam
Ghezzi, P.M. In Memoriam: W.Scott Wood 1940-2006 76
WHY BEHAVIOR ANALYSTS SHOULD STUDY GAMBLING BEHAVIOR

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The field of behavior analysis has been applied to solve many problems facing our society. Differential allocation of behavioral research to certain applied problems has resulted in positive changes in those areas while other areas remain underserved. Problem and pathological gambling are areas of concern in our society which have been minimally addressed by behavior analysts. Reasons for the underrepresentation of research in gambling are discussed and possible solutions to foster a behavioral understanding of and treatment for problem gamblers are presented.

Keywords: pathological gambling, addiction, behavioral therapy, applied behavior analysis

In the opening pages of the first issue of the Journal of Applied Behavior Analysis, it was made clear that the science of behavior analysis could be used and should be used to solve problems that faced our culture (Baer, Wolf, & Risley, 1968). During the past 40 years, advances have been made in a number of applied arenas such as developmental disabilities, autism, organizational behavior, and education. However, other critical problems exist in our society that appears relatively untapped by behavioral psychologists, behavioral therapists, and behavior analysts. One such problem is gambling. With prevalence rates of 1-3% of the population (National Gambling Impact Study Commission, 1999), pathological gambling is nearly 100 times more prevalent than of autism. Our society has a cultural epidemic on our hands.

Pathological gambling has not been ignored by the rest of social science. Theories abound as to what causes problem or pathological gambling. They include medical models of chemical imbalances (Kim, Grant, Adson, Shin, & Zaninelli, 2002), genetic mutations or predispositions (Lobo & Kennedy, 2006), sociological influences, cognitive processing errors (Toplak et al., 2007), or combinations of any of the above. During the past ten years the number of published articles archived in the PsychINFO database with the key word “Pathological Gambling” has grown substantially. In 1997 there were 29 papers published and in 2006 there were 142 papers published. This publication trend snapshot suggests that while behavioral researchers allocate their investigative activity to other domains, many others in science are exploring the behavior of gambling.

Allowing non-behavioral researchers to “solve” the gambling problem or explain the causes and cures of pathological gambling is unfortunate. Consequently behavior analysts will find themselves defending an unknown or unpopular position that may be at odds with growing accepted conceptualizations of
the disorder. Furthermore, as behavior analysts arrive late in the game, they will find themselves not being taken seriously and considered novices in an area of seasoned gambling “experts.” It is not necessarily the case that non-behavioral researchers will have nothing to offer, indeed they will. However, the types of research questions that are asked and how the data are explained by these non-behavioral scientists will surely differ from those schooled more principally in the behavior sciences.

The reasons for why behavior analysts have yet to make a meaningful and substantial contribution to the field of gambling are open to speculation. No true assessment has been conducted, and explaining causes for a behavior that did not occur is difficult if not impossible. Exploration into the “whys” and “why nots” of our field are warranted. At first glance it appears that researchers tend to allocate their responding to those options resulting in reinforcement. Such an analysis makes behavioral sense. Given the lack of funding for gambling research compared to research in developmental disabilities, education, or drug addiction, failed funding attempts would be considered failures to obtain sought after reinforcers. Without funding, the resulting research projects may be of minimal scope, fail to produce meaningful outcomes, and only found acceptable for publication in low impact journals. Again, the reinforcers seem lacking. Subsequent consequences result in poor merit reviews, risking tenure, and promotion. Compounded with the complications of using a clinical population for research purposes, attempting to generalize college student behavior to pathological gamblers, having people “gamble” in a laboratory, or capturing the gambling experience in analogue situations, it is reasonable to speculate that behavior analysts will find reinforcers elsewhere much more densely and immediately.

There are two types of solutions which can result in more behavior analysts contributing to an understanding of pathological gambling and gambling behavior more generally. The first type of solution is to provide a high profile, scientifically rigorous, peer reviewed journal that promotes behavioral research on gambling. This journal is such an outlet. In this first issue readers will see a wide range of authors, research methods, and data that suggest behavior analysts do in fact have something to contribute to the field of gambling. Add to this an editorial board of well respected scientists, a fast editorial turnaround process, and open access format to ensure high publicity of publications.

The second type of solution is a bit more delayed, probabilistic, and risky; much like gambling itself. The solution is to make behavior analysts realize that there are many individuals suffering from gambling disorders that could stand to benefit from the types of scientific outcomes that behavioral researchers could potentially produce. Our scientific rigor lends itself to discovering cause and effect relationships among events better than other sciences. The dismissal of constructs, internal mediators, and hunches, is what separates behavior analysts from many other disciplines and pseudo scientists studying gambling presently. We have the skills that can change lives, and as a result, should use them as best we can. Finally, we have a rich history in pure basic science. Embracing that laboratory foundation is critical to generating applied solutions to pathological gambling. As a result, the journal will span the field of behavioral science, from theory to practice, from basic to applied, and from individual to cultural. Only by acknowledging the breadth of our science and publishing the wide range of findings in one outlet can we have a unified voice in the gambling community.

There is considerable room for an additional outlet for gambling research, and specifically an outlet that is dedicated to the
scientific analysis of gambling. To date, a scientific-based journal dedicated to gambling that explores the phenomena in attempts to understand causes for the behavior has been lacking. Thus, I proudly present to you the first issue of the Analysis of Gambling Behavior.

REFERENCES


TOWARD AN INTEGRATIVE BEHAVIORAL MODEL OF GAMBLING

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Although the activity of gambling and the research on gambling continues to grow every year, behavior analysts have contributed minimally to the published literature. Theories of gambling abound from social to neurological frameworks, yet empirical data supporting such tenets is less than overwhelming. The science of behavior analysis often seeks data first and theory later. As a result, in the absence of a large body of data, behavior analysis has yet to put forward a comprehensive theoretical account of gambling behavior. Albeit limited, the behavioral data continue to emerge and collectively they begin to represent the foundation upon which a theory of gambling may rest. The present paper proposes an integrated behavioral model of pathological gambling, based on data, and consistent within a naturalistic account of scientific inquiry.

Keywords: Gambling, Delay Discounting, Verbal Behavior, Establishing Operation, Setting Event

The activity of gambling has been a part of human cultures for thousands of years. It has been reported that the early Greeks gambled for food, soldiers cast dice for Jesus’ belongings, and the founding fathers in the United States gambled regularly as a leisure-time activity. While gambling behavior is certainly not new in our culture, it appears quite clear that in modern times its prevalence is growing, especially in the United States (see Petry, 2005, for a recent review). In a recent report, Petry (2005) concluded the rate of pathological gambling was likely between 1 – 2% worldwide. Although this percentage in relative terms may be small, in absolute terms it represents millions of people. This estimate also does not include problem gamblers, who display some symptoms of pathological gambling but not enough to meet current criteria for pathology. In short, gambling, and the problems associated with it, affects many people.

Researchers in the behavioral sciences have not ignored the study of gambling. For instance, a literature search conducted using PsychINFO on March 21, 2007, using the word “gambling” in a general keyword search identified 3,038 articles. However, upon cross-referencing “gambling” with “experience,” the resulting number of articles was reduced to 154. A cross-referenced search of “gambling” and “behavior analysis” identified only 13 articles. While these analyses are cursory, they help highlight two glaring holes in the literature on gambling. Namely, very little of the research being conducted on gambling is using experimental methodology and less yet is coming from the behavior-analytic perspective.
There are numerous reasons for both these occurrences. For one, there are only a handful of researchers in the field of behavior analysis who identify gambling behavior as their primary research focus. Another issue is that in most locations, including nearly every state in the United States, laws governing gambling make it nearly impossible to conduct reasonably valid experiments on gambling behavior (see Weatherly & Phelps, 2006, for a review of this issue). Additional reasons include the fact that, although the behavior-analytic perspective dominated the field of psychology in the middle of the last century, numerous competing theoretical perspectives exist today. Likewise, funding agencies charged with supporting research and theory on issues such as pathological gambling, although not necessarily anti-behavioral, are populated by individuals from these other perspectives. Obviously, if the behavior analysis of gambling is to be a successful approach, then these reasons need to be faced and rectified.

The purpose of the present paper is several-fold. First, it is designed to give an overview of the behavioral perspective on gambling to date. This overview is not comprehensive, partially because such reviews exist elsewhere (e.g., see Ghezzi, Lyons, Dixon, & Wilson, 2006). However, it should serve to orient the reader to the behavioral perspective. Second, it is intended to synthesize differing behavioral processes into a single model. For example, although researchers (e.g., Dixon & Delaney, 2006) have argued, with data to back the argument (e.g., Wood & Clapham, 2006), that verbal behavior is critical to our understanding of gambling, few attempts have been made to marry rule-governed and contingency-governed processes into a single perspective. Third, and perhaps most importantly, this paper is intended to provide a single behavioral “theory” for gambling behavior.

The importance of this third intention may not be immediately clear. Behavior analysts have a long history of eschewing the hypothetico-deductive approach to research. However, behavior analysis is not devoid of theories (e.g., Generalized Matching Law; Baum, 1974) that have been derived from empirical, rather than rationalistic, sources (e.g., Herrnstein, 1961). The primary value of such theories is that they spur research, even if they are ultimately challenged or give way to competing viewpoints.

To date, no overt and encompassing behavioral theory of gambling exists. Thus, presenting one may indeed serve to facilitate additional behavior-analytic research. An additional benefit is that researchers outside behavior analysis often subscribe, sometimes quite heavily, to the hypothetico-deductive approach to research. Having a behavioral theory in which to couch research may therefore aid behavioral researchers when seeking an outlet (and funding) for their research. A similar argument can be made for therapists who may be required to provide theoretical justification for using behavioral treatments in treating individuals displaying gambling problems.

Behavioral Contributions to the Explanation of Pathological Gambling

The behavioral perspective has not been silent on the factors contributing to gambling behavior. The vast majority of the explanations have pointed to contingency-driven factors. That is, stimuli and/or consequences programmed by the game of chance itself that could potentially promote and maintain behavior. For instance, one of the longest standing tenets of the behavioral approach came from Skinner himself, who attributed the lure of gambling to the intermittent schedule of reinforcement used to pay off the player (Skinner, 1953; Skinner, 1974). More specifically, because most games of chance deliver wins on a random-ratio schedule of reinforcement, it
becomes possible to program a schedule of reinforcement (with money serving as the reward) that maintains a high amount of behavior despite being, over the long run, disadvantageous to the player (Skinner, 1974). Furthermore, research suggests that random-ratio schedules may become even more effective at maintaining behavior, relative to fixed-ratio schedules, as the response requirement becomes large or the organism is facing a negative-resource budget, both of which may be relevant to gambling situations and pathological gamblers (see Madden, Ewan, & Lagorio, 2007).

Few would dispute the idea that the schedule of reinforcement plays a role in maintaining gambling behavior. However, what has never been elucidated is why some individuals would come to display behavior that qualifies as pathological whereas other individuals, facing the identical schedule of reinforcement, would not (but see Madden et al., 2007, for a recent treatment of this issue). Given that pathological gambling occurs in 1–2% of the population (Petry, 2005), what is it about the intermittent schedule of reinforcement that affects these individuals differently than the other 98–99% of people who face them? To answer this question, behavioral analysts would undoubtedly point to the difference in “reinforcement history” across individuals, histories that would make some individuals’ behavior more sensitive or susceptible than others to these intermittent schedules of reinforcement.

Unfortunately, the exact nature of that “history” has never been spelled out. The history of the individual gambler is only known to a certain degree by an individual researcher, clinician, or therapist. Unlike the history of a laboratory animal that is completely controlled, the history of the human gambler in the natural world may never be exactly known. Furthermore, even when historical contingencies are discovered or reported during therapy, the often distant and uncertain nature of the person’s history makes it difficult to determine the interaction it may be having with the present contingencies. Perhaps the most obvious example of the failure to account for gambling based on the intermittent schedule is that of the behavior of the pathological lottery player who, while never having won, continues to play week after week. In such a situation, the individual may verbally identify what historical factors might contribute to such a behavior. However, the authenticity and accuracy of those factors may be questionable.

Other behavioral theorists (e.g., Petry & Roll, 2001) have speculated that there are numerous additional contingency-driven aspects of the gambling situation that promote gambling behavior. Beyond intermittent reinforcement, many games of chance alter the magnitude of reinforcement (e.g., video poker machines pay out differing amounts for different winning hands). Basic behavioral research has shown that organisms sometimes, but not always, prefer variable sized rewards to fixed amounts (see Madden et al., 2007, for a review). Generalizing this finding to gambling, varying the size of payouts would be expected to facilitate, rather than inhibit, gambling. Unpredictable intermittent magnitudes of reinforcement may also help sustain gambling.

Petry and Roll (2001) also suggested that response cost and immediacy of reinforcement can promote gambling behavior. Response cost refers to increasing the likelihood of a behavior by decreasing the effort (or cost) of engaging in that behavior. For example, consider the following. Most modern casinos have adopted slot machines that are equipped with bill collectors built into them (vs. having to find a casino employee selling coins), games that allow for multiple coins to be bet by the press of a single button (vs. having to put multiple coins into the machine manually), and/or devices that accumulate credits on the machine’s display (vs. dis-
pensing coins into a trough and requiring the player to put them back into the machine). All of these modern modifications of gaming devices could be conceptualized as examples of reducing response cost. From a behavioral perspective, gaming devices that lower response cost should, theoretically, promote gambling.

In terms of immediacy of reinforcement, research has long shown that organisms prefer immediate over delayed rewards (e.g., Chung & Herrnstein, 1967). Games of chance present the opportunity to obtain (sometimes substantial) monetary gains nearly instantly; gains that in some instances would take years to obtain through other means such as employment. From this perspective, it is not surprising that people gamble. Intuitively, one would think that these factors would also influence the potentially punishing consequences of gambling (i.e., losing money). However, the consequences of losing money are often themselves delayed, decreasing their control over behavior (see Madden et al., 2007) and perhaps explaining why the reported aversiveness of losing money is often less than what gamblers expect (Kermer, Driver-Linn, Wilson, & Gilbert, 2006). The gambler may also habituate (e.g., see Thompson & Spencer, 1966) to losses over time, further limiting their suppressive effect on gambling behavior.

These, among other potential factors, are reasonable and likely contributors to gambling behavior. However, much like Skinner’s reference to intermittent schedules of reinforcement, such factors appear to fall short of identifying the causes of pathological behavior. The characteristics of these game modifications do vary as a function of type of game (e.g., blackjack vs. lotteries), but all players who play a particular game face the same response cost and immediacy contingencies when playing. Again, it is not clear why these factors would lead a minority of gamblers down the road of pathology.

One behavioral attempt to explain why only certain individuals may become “addicted” was suggested by Rachlin (1997). In this conceptualization, he outlined four different psychological theories of addiction that are consistent with the behavioral perspective. While Rachlin’s analysis was largely couched in the context of substance abuse, the theories are also relevant to gambling. Rachlin’s preferred theory, called Relative-Addiction Theory, posits that “… consumption of the addictive substance creates an increase in price of both the addictive activity (X) and its substitute (Y). Addiction occurs when X remains cheaper than Y throughout consumption.” (p. 468). In the end, “repeated choice of X over Y … leads the addict to a point where the price of both activities is maximal.” (p. 468). In this case, X represents gambling and Y represents other activities the gambler could engage in besides gambling (e.g., spending time with his/her family, golfing or bowling, etc.). The more one gambles, the more expensive gambling becomes either because the gambler is in debt or, through the process of habituation, the gambler needs to risk an increasing amount of money to maintain the adequate amount of stimulation. However, the more one gambles, the more difficult it becomes to get as much from competing activities as one once did. For example, untended or neglected relationships are not as rewarding as before; by not golfing or bowling, one’s ability to play well has diminished. Thus, to return these competing activities to their previous level of reward, the gambler needs to invest more effort and time engaging in them. However, that investment exceeds the effort needed to continue to gamble. In fact, it always will be easier to gamble than not gamble, but additional gambling further increases the investment needed to engage in the competing activities. This tradeoff ultimately leads to pathology.

Rachlin’s approach has merit. It does not rely solely on contingency-driven aspects of
the gambling situation itself (e.g., intermittent schedules of reinforcement, immediacy of reinforcement) to explain the lure of gambling, although those aspects are incorporated into the theory. Furthermore, it outlines a dynamic process in which the relative context of gambling would lead to maladaptive or pathological behavior, as well as outlining how to prevent or reverse that cycle (i.e., invest more effort and time in competing activities). Like the factors discussed above, however, it is not clear how the Relative-Addiction Theory accounts for individual differences. Although the theory may be able to explain some differences across individuals (e.g., individuals from low socioeconomic levels may be more prone to pathological gambling than individuals from high socioeconomic levels because these individuals may have fewer competing activities to begin with), the theory does not clearly specify how some individuals can spend a great amount of time gambling yet not become pathological gamblers. At best, at least one additional explanatory mechanism would appear to be needed.

Other researchers (e.g., Dixon & Delaney, 2006) have argued that the missing mechanism lacking in a contingency-driven theory of gambling involves verbal behavior. To be more specific, behavior such as gambling can be controlled by the direct contingencies presented by the gambling situation itself, by learned verbal “rules” that govern the players’ behavior (that may or may not be accurate), or by both. Only if the gambler was a nonverbal human could a pure contingency-driven theory of gambling be validated. This point is why an animal model of gambling will always be somewhat lacking in external validity.

In attempts to support the conceptualization that understanding the verbal behavior of the gambler is necessary to form a comprehensive account of pathological gambling, Dixon and his research team have repeatedly demonstrated that “rules” can augment, or potentially even overcome, the contingencies programmed in the gambling game. For example, Dixon (2000) employed a within-subject design in which participants played roulette in several separate conditions. Across the conditions, participants were given no rules about the game and how to bet, were given inaccurate rules, or were given accurate rules. Results demonstrated that participants’ gambling behavior was altered by the introduction of rules even after players had experienced playing the game (in the condition that no rules were given) and thus had come into contact with the contingencies programmed by the game itself. Dixon, Hayes, and Aban (2000) also tested the influence of rules. They again had participants play roulette. However, in this study, both the outcome of the game (i.e., winning or losing) and the type of instructions given to players were manipulated. The researchers then performed a regression analysis on the results to determine what factors predicted when players would quit gambling. The results showed that the only significant predictor of players’ quitting was the instructions the participants had been given, not whether the players had won or lost. In other words, the results suggested that the instructions given to the players were more important in controlling the participants’ gambling behavior than were the outcomes the participants actually experienced when gambling.

In a recent conceptualization of pathological gambling, Dixon and Delaney (2006) suggested that to understand gambling problems, the focus of analysis must shift away from the contingencies of the game and toward the role of verbal behavior. That role potentially takes on additional importance because some of the rules that govern the behavior of gamblers may be self-generated. For instance, a player who adopts the rule “I am bound to win big soon” may prove to be very impervious to large losses and may look quite irrational to an outside observer who does not have direct access to the self-generated rule.
Indeed, this possibility is consistent with ideas that have been raised by non-behavioral theorists. Ladouceur, Sylvain, Boutin, and Doucet (2002), for example, argued that pathological gamblers are prone to engage in fallacious reasoning and that reasoning leads them toward pathology. One such example is gamblers’ failure to understand the independence of turns (e.g., gamblers may think that if the ball has fallen on red on each of the last five spins of the roulette wheel, then the probability that it will fall on black on the next spin has increased; a conclusion that is erroneous because the outcome of any spin of the wheel is independent from previous outcomes). From a behavioral perspective, such a misunderstanding would qualify as a “rule” that is governing the behavior of the gambler, with the possibility that the gambler generated that rule him/herself.

Not all rules need to be self-generated. In a casino environment, many rules / instructions are abundantly present, be they overt (e.g., “Everybody is a winner at …”) or covert (e.g., “Bet up to 100 credits”). Dixon’s research indicates that rules provided to the gambler can come to control the gambler’s behavior. However, despite the growing evidence that verbal behavior can play a significant role in gambling and gambling problems, its importance suffers from similar problems as the non-verbal factors discussed above. All casino gamblers are exposed to the same overt rules, so it is not immediately clear why some of them would follow those rules more readily than others. Perhaps it is only when we examine individuals’ propensity to follow rules (Wulfert, Greenway, Farkas, & Hayes, 1994), the interaction of such rules and contingencies, and how ex-posure to the environment and external rules may result in the emergence of self-rules idiosyncratic to individual players (Zlomke & Dixon, 2006), that we will be able to fully account for how verbal behavior impacts the behavior of the gambler.

Although behavioral theorists eschew placing personality characteristics in a causal role, research has been able to document that the behavior of pathological gamblers may differ from non-pathological individuals on a measure independent of gambling. Specifically, it appears that pathological gamblers discount future rewards at a greater rate than do non-pathological individuals (e.g., Dixon, Marley, & Jacobs, 2003; see Madden et al., 2007, or Petry, 2005, for reviews). When given the (hypothetical) opportunity between getting a small amount of money now or a large amount of money after a delay, non-pathological individuals choose the large rewards at longer delays than do pathological gamblers. In other words, future rewards do not appear to govern the behavior of pathological gamblers as well as they govern the behavior of non-pathological individuals. Because of this “discounting,” the behavior of pathological gamblers appears prone to be controlled by immediate rewards (programmed by games of chance; Petry & Roll, 2001) and rules presented in the immediate situation (e.g., “Everybody is a winner at …”) than the behavior of other individuals. This control may then cause these individuals to make decisions and generate rules that lead them down the road to pathological gambling.

The difference in discounting future rewards is an interesting finding, partly because it is an inherent assumption of Rachlin’s (1997) Relative-Addiction theory (i.e., gamblers may be insensitive to the future rewards associated with not gambling and instead choose the immediate opportunities for reward that can be provided by gambling). As noted numerous times, however, it again is not immediately clear why or how the difference in discounting between pathological and non-pathological gamblers comes about. Furthermore, it has been recently reported that pathological gamblers discount future rewards more severely in gambling contexts than in non-gambling contexts (Dixon, Jacobs, &
Sanders, 2006), suggesting situational control over what is often considered to be a trait measure.

Thus, although behavioral theory has not been silent on the issue of gambling behavior, a synthesized behavioral account has yet to be forwarded. Researchers have identified factors related to games of chance that would be expected to promote gambling behavior. Furthermore, theorists have outlined scenarios in which competition between these factors and those controlling non-gambling behavior would lead individuals to choose gambling despite this choice being the poor one in the long run. Researchers have also identified potential causal mechanisms (i.e., the presentation of verbal “rules”) that can contribute to, if not outright control, gambling behavior. Additionally, they have identified that gamblers may differ from non-gamblers in ways that could explain why some come to suffer from gambling problems. Together, these findings add to our understanding of gambling. However, even in sum, they do not identify why some individuals are susceptible to gambling problems when others are not or, when they do indicate how some individuals may indeed be more susceptible than others, there is little indication as to how the individuals became that way.

Establishing Operations and Setting Events

The above factors will certainly be important to a comprehensive behavioral theory of gambling. However, a major theoretical component, which includes establishing operations (Michael, 1993) and setting events (Kantor & Smith, 1975), has been missing. Establishing operations are situations or events that change the efficacy of a reinforcer and, as a result, change the probability that a certain behavior will occur. For example, setting one’s alarm clock is reinforced by the consequence of being awakened at a certain time and getting into bed serves as one discriminative stimulus for setting the alarm clock. However, one does not necessarily need to be awakened at a certain time every day of the week (e.g., on weekdays, but not weekends). Day of the week would be considered an establishing operation in this example because it dictates the efficacy of being awakened. As an establishing operation, day of the week would alter whether getting into bed will result in the alarm clock being set or not. A setting event, while often used interchangeably with establishing operation, is less transitional than the establishing operation. Examples of setting events might be getting cancer, a new relative living in your home, a season or weather pattern, etc. In the scope of gambling, setting events could include getting a raise at work, becoming unemployed, being in an unsatisfying marriage, or moving into a neighborhood that has a casino. In summary, the “momentary” nature of the establishing operation is not present with a setting event.

The potential importance of establishing operations and setting events in our understanding of gambling behavior has not been entirely ignored by behavior-analytic researchers (e.g., see Dixon et al., 2003). However, the idea has not been systematically pursued. Establishing operations and setting events represent potential mechanisms that will allow a behavioral theory to explain how some individuals may ultimately become pathological gamblers while other individuals may face the same gambling situation and not suffer from pathology. The question is; can one identify the environmental variables that serve as establishing operations or setting events for problem gambling?

As noted above, there is a vast literature on gambling behavior. Although little of that research has come from a behavior-analytic perspective, any successful behavioral theory must, at worst, account for the results of that research. At best, it is possible that the existing research can inform the behavioral perspective. Fortunately, the latter appears to be
the case when identifying potential establishing operations and setting events.

Petry (2005), in her extensive review of the gambling literature, identified six known risk factors for pathological gambling. By far the most prominent of these factors is substance use and abuse. Comorbidity of substance abuse and pathological gambling is so high that Petry recommends that therapists working with a member of one population screen for the presence of the other problem. The remaining risk factors are socioeconomic status (SES), minority membership, gender, age, and marital status. In short, a young male of a minority group, who is poor, single, and is a drug user, is at high risk for becoming a pathological gambler.

**Known Risk Factors as Potential Establishing Operations/Setting Events.**

According to the model being proposed in the present paper, several of these risk factors may influence gambling by serving as establishing operations or setting events. One factor that should serve as a setting event is SES. Low SES should alter the reinforcing value of money, which should alter how one weights immediate vs. delayed monetary rewards. The shift toward more immediate rewards should promote gambling, which in turn will likely exacerbate the person’s monetary standing through losses. Those losses will then further increase the reinforcing value of money that is immediately available. This cycle would lead one down the road to pathological gambling (and see Madden et al., 2007, for a description of how SES may influence delay discounting).

It may also be the case that membership in a minority group may serve as a setting event. This possibility may be difficult to confirm because membership in a minority group is very often linked to SES. Thus, members of minority groups may discount future rewards to a greater extent than members of the majority because of low SES and not because of minority group membership *per se*. However, culture factors may serve as establishing operations (or setting events) independent of SES. Specifically, cultural practices and norms, and how minority group members experience these, may make them vulnerable to pathological gambling more so than members of the majority culture. The existing literature provides at least one potential example of this possibility.

Research suggests that American Indians suffer from pathological gambling at up to 16 times the rate as the majority, non-native population (Wardman, el-Guebaly, & Hodgins, 2001). Several different researchers have suggested that American Indians’ mental health (LaFromboise, Coleman, & Gerton, 1993) and/or gambling problems (Raylu & Oei, 2004) are highly influenced by their cultural competency. That is, LaFromboise et al. (1993) argued that how American Indians identify with their own and with the majority culture greatly impacts their mental health. American Indians who identify with both cultures (i.e., Bicultural identification) will benefit with greater mental health than those who identify with only American Indian (i.e., Traditional) or the majority culture (i.e., Assimilated). Those with low identification with both cultures (i.e., Marginal) should be, according to LaFromboise et al., very susceptible to mental health problems such as pathological gambling.

From a behavioral perspective, cultural identification of American Indians may be serving as a setting event. One could hypothesize that American Indians with Traditional, Assimilated, or Marginal cultural identities should differ from those with Bicultural identities in terms of how they discount future rewards. These identities may also correlate with what consequences maintain gambling behavior. These differences would promote gambling and are what would make these individuals susceptible to suffering from gambling problems. Because majority group
members are not required to reconcile more than one cultural identity, one would predict that their prevalence of pathological gambling should be lower than those who must attempt such a reconciliation. If anything, this example highlights the potential predictive power that can be captured by incorporating factors into a model that are typically considered outside of the behavioral perspective (e.g., cultural identity). Factors such as cultural identity may be conceptualized within a behavioral framework as setting event. Similar examples could easily be drawn with other minority populations.

Substance use and abuse could potentially be conceptualized as an establishing operation and a setting event, respectively. That is, substance use may momentarily alter the consequences for risky behavior whereas substance abuse may alter various response-reinforcer interactions within a psychological field over time. However, although substance use is highly correlated with pathological gambling, it is not clear that it serves in a causal role, at least not to begin with. Research has demonstrated that, similar to pathological gamblers, individuals who are substance dependent, or suffer from addictive disorders, discount delayed rewards at a greater rate than do controls (e.g., Kirby, Petry, & Bickel, 1999; Petry, 2001; and see Petry, 2005 for a review). In fact, some evidence exists to suggest that substance use and gambling behavior are not predictive of each other, but rather occur because of a similar underlying factor (Vitaro, Brendgen, Ladouceur, & Tremblay, 2001). That factor may be delay discounting. If increases in discounting delayed rewards indeed make individuals more prone to gamble and become pathological gamblers, then it is logical that it would also make them more prone to use drugs and become chronic users. This view is a testable one. It should be possible to demonstrate that changes in delay discounting precede drug use (and pathological gambling).

This view also does not preclude the idea that chronic drug use can contribute to pathological gambling. It may in fact do so if the drug use leads the individual into financial debt. In such an instance, one would expect the individual to discount delayed rewards (much as would a person with low SES). This latter point could potentially explain why individuals who are substance abusers and gamblers discount future rewards at a significantly greater rate than those individuals who are only substance abusers (Petry & Casarella, 1999).

As Petry (2005) pointed out, marital status as a risk factor for pathological gambling is difficult to interpret. The fact that pathological gamblers are more likely to be single or divorced than non-pathological gamblers is very possibly the outcome of the pathological gambling rather than a cause for it. Fortunately, this assumption is also a testable one. For example, if true, then it should be possible to document that differences in how individuals discount delayed rewards varies as a function of their gambling behavior, not as a function of their marital status.

It also seems reasonable to posit that age serves as a setting event and does so by altering the value of the monetary outcome of gambling. In general, winning money becomes less important as one grows older, likely because one has accumulated wealth one did not have when young. How individuals discount future rewards also likely varies with age. Young individuals discount future rewards more steeply than older individuals, leading to impulsive behavior (see Logue, 1995, for a review). The ability of delayed rewards to control behavior increases with age, leading to an increase in the display of self control (e.g., Rachlin, 1974). Thus, in general, the changes in delay discounting that come with age should work against the appearance of pathological gambling; this again is consistent with the existing data on pathological gambling.
However, changes in delay discounting with age may be bitonic. That is, it seems likely that the discounting of delayed rewards again begins to occur more steeply as individuals become increasingly old because, as the individual’s future shortens, immediate rewards should start to gain more and more control over behavior. If true, then this change should promote the appearance of pathological gambling in the elderly. It should be possible to document this change in the discounting functions. Even if this change does occur, however, the elderly may be buffered against developing into pathological gamblers because of their SES or because they are gambling as an escape rather than to win money.

Age may also contribute to pathological gambling outside of serving as a setting event. Specifically, the reinforcing consequence of gambling may change as individuals age. Research suggests that young individuals who gamble (e.g., college students; Neighbors, Lostutter, Larimer, & Takushi, 2002) do so most often to win money. However, as individuals age, they are increasing likely to gamble for entertainment (i.e., arousal) and/or as an escape from boredom (see Petry, 2005, for a review). If the consequence maintaining the gambling behavior plays a role in whether the individual will become a problem gambler, then one would (correctly) predict that young individuals would be more prone to suffer from gambling problems than would aged individuals.

It is not clear how the final factor, gender, serves as a setting event as it remains a constant for most individuals throughout their lives. Yet, prior investigations have shown gender differences do exist when evaluating gamblers. For instance, research suggests that males and females differ in terms of their preference for different games of chance, with men preferring card games and sports betting and women preferring slot machines and bingo (e.g., Mok & Hraba, 1991). Additionally, a fairly vast amount of research indicates that males are more impulsive than females (e.g., Calvete & Cardeñoso, 2005; Soloff, Kelly, Strotmeyer, Malone, & Mann, 2003) and that that impulsivity (i.e., discounting future rewards more steeply than females) may play a role in gambling problems (e.g., Martins, Tavares, Lobo, Galetti, & Gentil, 2004; Petry, Kirby, & Kranzler, 2002). If gender indeed serves as a critical variable, then it should be possible to document differences in delay discounting between genders.

A Role for Verbal Behavior.

As noted above, verbal rules can augment the actual contingencies of games of chance to further promote gambling or they may completely overcome those contingencies altogether. Thus, any comprehensive account for pathological gambling should identify the role of verbal behavior. To date, research suggests that verbal behavior might actually play multiple roles in the appearance of pathological gambling. One role verbal rules might play is as discriminative stimuli. The rules may, properly or improperly, indicate to the gambler that bets, games, or patterns of playing will now be reinforced (e.g., “I lost at blackjack last time, so this time I will win”). If, as discriminative stimuli, these rules lead to large monetary losses, they make the individual prone to pathological gambling. Fortunately, if verbal rules are serving as discriminative stimuli, then their influence should be open to change through the consequences experienced by the gambler who is following them.

The second potential role of verbal behavior (i.e., rules) may be to serve as a type of establishing operation. If individuals subscribe to rules that alter the efficacy of the consequence maintaining gambling behavior (e.g., it’s more important to win than to have fun), then those rules may alter how individuals discount future rewards. In the literature on rule-governed behavior, these types of
rules are termed *Augmentals* (Hayes, 1989; Valdivia, Luciano, & Molina, 2006), and are considered a type of verbal establishing operation. Examples of such a rule might be “*Hot slots, hot lights, lots of fun*”, “*What happens in Vegas stays in Vegas*”, or “*Loosest slots in town*” and any of the other witty commercial slogans used by the gaming and tourist industry. Here the rule does not describe a behavior-contingency relationship but instead potentially alters the reinforcing value of gambling altogether.

Self-generated rules may serve a variety of functions for an individual gambler, thus an analysis of their topography alone is insufficient to explaining the controlling variables. Take for example the sentence “*I have my lucky Red Sox shirt on.*” To the casual reader, this sentence may do little if anything to stimulate gambling (i.e., if someone gave you this shirt, you would not feel inclined to gamble). However, consider the following example and how this sentence may have an individualized functional relationship with gambling. Upon entering the casino a novice gambler finds an empty chair at a slot machine. The machine is of the variety “Red, White, and Blue” in which large payoffs are made when three sets of bars line the payoff window. Over the course of one hour of play, this individual comes close to winning a number of times, and then, with one more spin of the reels, wins a large jackpot when three sets of red bars land on the win line. Obviously excited, this player informs his friend of what has occurred, who proclaims “*Red must be your lucky color.*” The next day, recalling the phrase from the prior day, the gambler selects a red shirt to wear the next morning. Even upon seeing the shirt in the closet, an increased tendency to gamble is reported. Despite attempts to draw this person out of the casino, he repeatedly states, “*I will win. I am wearing my lucky shirt.*” While the red shirt has never been paired with winning, or perhaps even gambling, certain psychological functions have emerged between the red bars of the slot machine, money won, the friend’s comment, and a shirt with the word “*Red Sox*” on it.

The specific means by which such individualized psychological functions are developed is beyond the scope of the present paper, and the reader is encouraged to seek out more comprehensive accounts of the development of complex stimulus networks in the context of gambling (e.g., Dixon & Delaney, 2006; Zlomke & Dixon, 2006). To suffice, it is clear that complex stimulus networks and the resulting self-generated rules likely contribute to the between-person differences observed in development of pathological gambling.

**Beyond Programmed Reinforcement Contingency Control**

Early behavioral conceptualizations of pathological gambling were solely limited to contingency control. Intermittent reinforcement of the gaming device was responsible for sustained behavior. However, pathological gamblers are not in closed environments. That is, the outcome of a gamble is not the only source of reinforcement to which they are exposed. Instead, the gambling context is dynamic and presents a variety of sources of reinforcement. Some of the reinforcement options may be available concomitantly, whereas others might be available concurrently. For example, a problem gambler may seem clearly foolish if he or she repeatedly gambles and loses trial after trial. However, if that gambler is wagering only small amounts of money and is receiving complementary items while doing so, then this behavior may look less foolish.

The gambling response and the outcome of the gamble alone (i.e., money), is far from the sole controlling contingency in place for many people with gambling problems. It is very possible that one individual may gamble for the possibility of increased monetary outcomes, but another may engage in gambling
to escape from problems at home or work. Still another person may gamble as a means to socialize with friends at a weekly card game. While the behavior itself may be similar, the functional controlling variables are not. Individualized assessment and treatment of pathological gamblers is crucial for successful treatment outcome and usually involves replacement activities that serve the same behavioral function (see Petry, 2005). In summary, contingencies of reinforcement are surely at work for any given gambler, yet limiting the description of such contingencies to the outcome of the gamble are overly simplistic and fail to consider the other behavior-contingency interactions that are present in the broader contextual environment.

The Integrative Behavioral Model of Gambling

The proposed model tries to take into account the evidence presented above. That evidence suggests that there are likely three mechanisms that lead to or sustain problem or pathological gambling. Contingencies, Rules, and Establishing Operations/Setting Events all interact in a dynamic contextual medium participating in varying degrees across individual gamblers. The first is the presence of an establishing operation or setting event that alters the efficacy of the consequence maintaining gambling behavior. That change in efficacy influences gambling behavior by altering how the individual discounts delayed rewards. Specifically, establishing operations/setting events such as SES, gender, cultural identity, age, and (potentially) verbal “rules” increase how steeply individuals discount delayed rewards, which in turn promotes gambling and leads to problem or pathological gambling. The second mechanism is the consequence that is maintaining the gambling behavior. Gambling provides multiple consequences. Under the proposed model, individuals gambling for monetary gain will be prone to pathological behavior. Individuals who gamble for excitement or as an escape response should be less prone to become pathological gamblers unless, through losses incurred by gambling for excitement or as an escape, winning money becomes the primary reason for continued gambling. Factors such as age or the establishment of certain verbal rules may also alter what consequences control gambling and thus also contribute to pathological gambling. The third mechanism is verbal rules serving as discriminative stimuli for gambling. If these rules are fallacious, then they may not only promote gambling, but also alter the consequence(s) maintaining the gambling behavior. If these rules lead to losses, and thus an increase in the efficacy of winning money, then they will serve to promote pathological gambling.

Advantages of the Model

The proposed model has a number of aspects to recommend it. First, as noted several times already, it is consistent with the existing data on pathological gambling. In fact, in some cases the existing research is so consistent that the data actually identify the behavioral mechanism. Second, unlike prior behavioral explanations for gambling, it provides theoretical mechanisms (i.e., rule repertoire and establishing operations/setting events) to account for how the same contingencies (e.g., intermittent schedules of reinforcement programmed by games of chance) may lead some individuals toward pathological behavior but not do so for other individuals. This hurdle is an important one for several different reasons, with one being that behavioral theorists will not be required to rely on the nebulous explanation of “differences in reinforcement history.” Third, the present model, unlike past behavioral explanations, incorporates verbal behavior and the importance of verbal rules followed by gamblers. Not only is this incorporation novel, it is also multifaceted. Verbal behavior itself is com-
plex and how it interacts with gambling behavior is unlikely to be simple and straightforward. Perhaps most importantly, advances in our understanding of verbal behavior have a home in the present model. Fourth, the model makes a number of testable predictions. By doing so, it outlines a number of studies interested researchers could conduct to test the theory’s validity. Importantly, the present model also allows for an independent measure of pathology. That is, much of the proposed theory lies in the idea that how one discounts delayed rewards is a causal force behind pathological gambling. This idea is not only consistent with the existing literature (see Madden et al., 2007, and Petry, 2005, for reviews), but one can study delay discounting independently of pathological gambling. Fifth, because the model identifies causal mechanisms for pathological gambling, it will also identify specific treatment options for pathological gamblers. Exactly what those treatments should be will depend upon how well future research supports the theory and exactly which mechanism is controlling the pathological gambling of a particular individual. However, at the risk of being premature, these treatments will need to address the establishing operations that have altered the efficacy of the consequence maintaining the gambling, the verbal rules that the individual’s behavior is being controlled by, and/or the consequence (i.e., money, arousal/excitement, and escape) reinforcing the gambling.

Finally, the model is relatively inclusive. As should be apparent from the above discussion, although it is a behavioral theory, it can successfully incorporate factors that contribute to gambling that come from different perspectives (e.g., cultural identity). This fact should help promote gambling research that is couched in behavioral terms. Perhaps more importantly, a successful behavioral theory could stand to enlighten, rather than simply explain, research from other perspectives. For instance, it is becoming increasingly popular for researchers to attempt to determine how brain function relates to behavior such as pathological gambling (e.g., Potenza et al., 2003a, 2003b). By identifying different causal mechanisms, the present theory may serve to point such researchers to specific areas of the brain.

It seems quite possible that some of the ideas proposed in the present paper will need to be modified as new research tests them and new results emerge. It may also be the case that some of these ideas will prove either incorrect or incorrectly weighted in the present model. These possibilities notwithstanding, the present model is an attempt to present a synthesized behavioral approach to gambling, to provide a theoretical basis for future investigations of gambling behavior and its treatment, and to identify specific testable predictions for behavioral researchers. If any of these attempts are in any way fruitful, then the present model will fill a major void in the behavioral literature on gambling.

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*Action Editor: Simon Dymond*
COMMENTARY

VERBAL RELATIONS AND THE BEHAVIOR ANALYSIS OF GAMBLING

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Photographs of rats pressing levers and people pressing the “spin” button on slot machines are commonly juxtaposed in textbook and media portrayals of behavior-analytic approaches to gambling. Such portrayals appear to explain the lure and persistence of gambling in direct-contingency terms by appealing solely to the operating schedule of reinforcement. It is perhaps understandable then, that these portrayals may leave the lay community and researchers from other disciplines with the impression that behavior analysis has already “solved” gambling and moved its research attention elsewhere.

Weatherly and Dixon’s article is, therefore, an attempt to update such portrayals and to provide a contemporary behavior-analytic account of gambling. Their scholarly account shows that behavior analysis has emphasises more than just direct-contingency processes. The feature of Weatherly and Dixon’s model that we wish to comment on is their emphasis on verbal behavior as the missing mechanism or process in previous behavioural accounts of gambling. We are in complete agreement with the authors on this point, and suggest that the traditional emphasis on direct-contingency accounts was based, at least in part, on the strategic assumptions governing operant research and by the prevailing definition of verbal behavior (Dymond, Roche, & Barnes-Holmes, 2003). Both factors may have hampered the growth of the experimental analysis of gambling.

Weatherly and Dixon do not functionally define what it is that they refer to by “verbal,” “rules”, or “verbal behavior”. In view of the importance that verbal behavior plays in Weatherly and Dixon’s argument, a functional definition of verbal events is essential. Although a detailed analysis of this issue is beyond the scope of the present commentary, both Skinner’s (1957) definition of verbal behavior and the resulting account of rules as mere discriminative stimuli may actually have hampered research on gambling because they are too broad (Dymond, O’Hora, Whelan, & O’Donovan, 2006; O’Hora & Barnes-Holmes, 2001). For example, the Skinnerian definition of verbal behavior includes all responses on gambling tasks:

Our definition of verbal behavior incidentally includes the behavior of experimental animals where reinforcements are
supplied by an experimenter or by an apparatus designed to establish contingencies which resemble those maintained by the normal listener. The animal and experimenter comprise a small but genuine verbal community (1957, footnote 11, p. 108).

Employing Skinner’s definition, it appears that many kinds of gambling behavior include “verbal behavior”. Thus, researchers who seek to apply Skinner’s taxonomy to gambling actually return to where they started: in the nonhuman, direct-contingency, and lab. If Weatherly and Dixon’s account is to avoid the pitfalls of the past, then a new approach is needed to analyse and understand the role of verbal behavior in gambling.

Research on derived relational responding provides a modern functional-analytic definition of verbal stimuli as stimuli that acquire some of their functions by virtue of participation in relational frames. Functionally defining verbal behavior in this way allows for an empirical investigation of the intriguing possibility that, for verbally able humans, all gambling is verbal activity. By this we mean that many of the events that induce and maintain gambling are “discriminative-like”, or verbally constructed, and that the behavioral processes involved differ from those seen with nonhumans. We see future research on gambling progressing in tandem with research on derived relational responding. While nonhuman research still has a role to play, it is in the arena of human operant behavior that the key research advances are needed.

Gambling may initially come under the control of apparent discriminative stimuli such as instructions or self-statements but, as Weatherly and Dixon themselves admit, if this is the case, then “their influence should be open to change through the consequences experienced by the gambler following the rule”. Likewise, talk-based therapy for pathological gambling that directly challenges the content of self-verbalizations should be uniformly effective. The misery and debt that result from a gambling problem suggests that this simply does not happen. Direct-acting contingencies of reinforcement and punishment do not stop people from risking all their worldly possessions on the roll of a dice.

Weatherly and Dixon’s account highlights that behavior analysis needs a fresh approach to understanding the role played by verbal behavior in the analysis of gambling. Only further empirical research will show whether or not an approach based on verbal behavior as derived relational responding will prove useful in the behavior analysis of gambling.

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Action Editor: Mark R. Dixon
COMMENTARY

DELAY DISCOUNTING AND PROBLEM GAMBLING

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Weatherly and Dixon have provided a behavioural model of gambling that seeks to integrate findings from previous behavioural research and provide a testable framework for future behaviourally oriented gambling research. A strength of the model is that it incorporates a number of mechanisms that have not previously been well integrated in other (especially non-behavioural) models of gambling, namely the recent work on verbal, self-generated ‘rules’ and their influence on gambling-related contingencies. This integration echoes earlier calls for the greater assimilation of behavioural and cognitive accounts of problem gambling and should be seen as a positive development.

As the authors highlight, behavioural theories of gambling that simply focus on the contingencies of the game of chance itself are incomplete. Indeed, this had been a criticism of earlier behavioural theories. The rather nebulous term ‘reinforcement history’ used in the behavioural literature seems particularly unhelpful in the context of problem gambling. In their discussion of the advantages of their model, Weatherly and Dixon note the importance their model places on a presumed causal mechanism underlying problem gambling, in this case delay discounting. In their words, ‘much of the proposed theory lies in the idea that how one discounts delayed rewards is a causal force behind pathological gambling’. While there are several studies that document a link between delay discounting and gambling behaviour, the evidence documenting this link is certainly less than unequivocal at this stage (see Reynolds, 2006, for a review). In particular, the link between delay discounting and moderate, but still problematic, levels of gambling seems unclear at this point (Holt, Green & Myerson, 2003).

More importantly perhaps, there is increasing awareness that impulsivity itself is multifaceted and that delay discounting may only be representative of one ‘factor’ of impulsivity. For example, Reynolds, Ortengren, Richards and de Wit (2006) examined the relationships between a range of self-report and behavioural indices of impulsivity. A principal components analysis of the behavioural tasks found two components, labelled ‘impulsive disinhibition’ and ‘impulsive decision-making’, with a delay discounting task only loading on the latter component. More generally, it might be said that commonly used behavioural measures of impulsivity seem to differentially index both impulsivity related to motor control of relatively automatic behaviour and ‘higher level’ forms of impulsivity that have a substantial cognitive component. The relationship between problem gambling and both of these factors remains an open empirical question at this point. If a behavioural theory of gambling is going to posit causal mechanisms, then it will need to incor-
porate more sophisticated models of the presumed underlying deficit in impulse control exhibited by problem gamblers.

More briefly, a further limitation of the proposed model is that it does not seek to incorporate different sub-groups of problem gamblers based on their preferred mode or form of gambling (e.g. electronic gaming machine versus sports gamblers). There has been increasing recognition of the heterogeneity of problem gamblers in terms of their usual mode of gambling and the differential pathways towards problem gambling that these sub-groups may have. Sub-groups of problem gamblers differing by primary mode of gambling may have substantially differing primary motivations for gambling (e.g. money, ‘arousal’, escape) that may have important implications for understanding their behaviour. Indeed, one recent cognitive-behavioural theory of gambling has explicitly modelled differences across primary forms of gambling (Sharpe, 2002). Weatherly and Dixon’s model may ultimately need to incorporate something along similar lines.

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COMMENTARY

GETTING THERE: COMMENTARY ON “TOWARD AN INTEGRATIVE BEHAVIORAL MODEL OF GAMBLING” BY WEATHERLY AND DIXON

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Weatherly and Dixon have taken an important step by proposing a coherent behavior-analytic formulation of gambling to account for individual differences in the development of gambling problems. They rely on the cumulative and interactive effects of several well-established behavioral mechanisms to build their analysis. They also make a compelling case for avoiding overly simplistic accounts of the complex activity of gambling, and that alone is of service to the behavioral community.

I applaud many things about this formulation. It illustrates how gambling is in part rule-governed, affected by setting events and prevailing contingencies, and impacted by discounting of delayed rewards. Of course, more empirical work is needed in all of these areas. Fortunately, there is growing interest among behavior analysts in gambling, and I expect to see more examples of careful analyses of contributory factors such as this one. Weatherly and Dixon have met their goal of moving toward an integrative behavioral model of gambling, and although we’re not quite there, the model is a step forward, and a leap ahead of the alternative conceptualization on which most current treatment is based: that compulsive gamblers are immature, diseased individuals with an unconscious need to lose.

But there is danger in dismissing some important considerations too quickly. The authors are correct in presenting lotteries as poor examples of control by intermittent schedules. In fact, lottery players are insensitive to changes in the odds of winning, and jackpot size alone accounts for more than 90% of betting variability (Lyons & Ghezzi, 1995). That does not mean that intermittent schedules of monetary reinforcement have little importance in most gambling. Video poker and slot machines (line games) employ much richer intermittent schedules, maintain much higher levels of participation, and are associated with much greater risk of pathological play than are lotteries (Lyons, 2006). Others have examined whether the “near miss” can serve a conditioned reinforcing function within intermittent schedules. We may yet find that intermittent schedules of reinforcement play a larger role than the current authors allow.

I pause at the easy dismissal of the “nebulous” history of reinforcement as well. Some players are coming off of a recent win, or a recent near miss, or a string of wins or losses, which leads me to consider whether all players sitting around a poker table (for example) “face the same response cost and immediacy contingencies when playing” (p. 7). That...
These issues notwithstanding, I find the effort an important and admirable step in the right direction. The Weatherly and Dixon model has much to commend it, and much for us to discuss.

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Action Editor: Simon Dymond
THE ALLOPLASTIC NATURE OF PATHOLOGICAL GAMBLING

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Weatherly and Dixon address how changes in the environment impact a person’s propensity to gamble, as well as problems individuals can develop when this behavior pattern becomes excessive. While research has grown exponentially on gambling in the past decade, Weatherly and Dixon suggest that very little of it has been informed by a behavior analytic perspective, and they argue that this perspective may have much to offer.

A primary concern in the field relates to providing a viable account for individual differences in susceptibility to gambling problems. Cost and benefit parameters of reinforcement schedules clearly impact decisions to gamble, ranging from placing a quarter in a slot machine to making a $500 bet between friends. However, when changes are made designed to increase gambling choices, everyone who gambles is exposed to them, but only some respond. Given these differences, the authors suggest that differential sensitivities to gambling contingencies of reinforcement are not in the environment but in human language. As such, they suggest that behavioral approaches to human language and cognition may prove fruitful in understanding susceptibilities to gambling problems.

We agree with this proposition but will quibble with some of the finer points. First, they seem to suggest that pathological gamblers may be more susceptible to following verbal rules, or at least are more likely to attribute their gambling actions to these rules. Consider the examples of blaming the environment for gambling losses, but believing wins are related to personal skill. Dixon and Weatherly believe that studying verbal control of human gambling is fundamental because empirical laboratory evidence reveals that when verbal control is pitted against contingency control, it is the former that generally wins. There is no arguing with these data, but we urge caution in their interpretation. We believe it likely that many of these findings are compliance effects; the subject follows instructions even if it means that total income declines. The infamous Milgram experiments demonstrate the lengths to which humans will go to comply with instructions of an experi-

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menter. If these findings are fully generalizable, then treating pathological gambling could be greatly simplified; therapists would simply instruct them to stop.

While we agree that verbal processes govern a good deal of human behavior, our final comment is that we think they have underestimated how much can be learned about individual susceptibilities to gambling by studying nonhuman behavior. For example, accumulating evidence suggest that genetic factors may play a role in the degree to which an individual discounts delayed outcomes and that individual differences in delay discounting may be predictive of drug taking. At the same time, some evidence suggests that programmed experiences can change animals’ rates of delay discounting. Further, as noted by Dixon and Weatherly, quantitative differences in the rate at which delayed outcomes are discounted are predictive of susceptibilities to random-ratio schedules and other unpredictable delays to rewards that are endemic to games of chance. These findings and the theories stemming from them have relied upon the study of contingency changes in nonverbal animal subjects.

Only data can address the complex question of who and why some individuals become pathological gamblers and others do not. Perspectives and inquiries across multiple domains may eventually help prevent excessive and harmful gambling, as well as improve treatment for those who go on to develop significant problems.

Action Editor: Simon Dymond
COMMENTARY

INTEGRATIVE MODEL OR FRACTURING FRAMEWORK: BETTER WE HEDGE OUR BETS

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Weatherly and Dixon proposed a behavior analytic account of gambling. There were many excellent points made in the paper, and we were in agreement with many of them. Certainly, any conceptualization of gambling that ignores establishing operations and the contribution of verbal behavior will be incomplete. Here we address three main issues related to their proposed framework. First, it was not clear whether the framework encompasses gambling, ‘pathological’ gambling or both. Furthermore, definitions of these terms were not provided, an omission that invites conceptual confusion.

The second issue concerns the treatment of delay discounting. A preponderance of evidence suggests a relationship between steep delay discounting and addiction-type pathologies (alcoholism, nicotine dependence, pathological gambling, etc.). Weatherly and Dixon assert, however, that steep delay discounting is not only associated with pathological gambling but actually causes it. Further, they contend that factors known to increase or decrease the likelihood of pathological gambling exert their effects through their effect on delay discounting. Several difficulties with this aspect of their framework arise. First, it is not clear how temporal discounting relates directly to gambling behavior. Gamblers do not choose between small, immediate and large, delayed reinforcers but between small, certain and large, probabilistic reinforcers. If one conceives of gambling in this way, problem gamblers exhibit shallow probability discounting functions rather than steep delay discounting functions. Second, to argue a causal role for a hypothetical gradient that has been inferred from other behavior is circular reasoning.

The third issue concerns the degree of integration and inclusiveness of the framework. The framework excludes or minimizes integral pieces to the puzzle, such as genetics, neurophysiology, Pavlovian conditioning and the role of nonhuman research. The potential contributions of these areas on understanding individual differences should be reason enough for their inclusion. The remainder of the commentary will focus on the role of nonhuman research. The position of Weatherly and Dixon that “…an animal model of gambling will always be somewhat lacking in external validity” unnecessarily minimizes the potential contributions of nonhuman research to the understanding of gambling. Whenever nonhuman models are used to explore a human problem, there exists a trade-off between experimental control and external validity. That non-humans lack verbal behavior is not the only area where external validity may be
lacking, but it is also far from a fatal blow to their potential usefulness in exploring the conditions that may be necessary and sufficient to produce gambling. Nonhuman research confers many advantages. First, while the authors admit that one of the pitfalls with a “reinforcement history” approach to human pathological gambling is that “the history of the human gambler…may never be exactly known,” this is not a problem for a nonhuman model. Second, experimental designs (rather than correlational ones) can be implemented without having to get around ethical and legal problems. Finally, problems with interpreting cause-effect sequences (as with the relationship between marital status and problem gambling) can be minimized. These advantages can more than outweigh the cost of sacrificing external validity.

Not too long ago drug abuse was considered a uniquely human phenomenon. This view changed when it was demonstrated that drugs could function as positive reinforcers for nonhumans; the resulting contribution to our understanding of drug abuse has been enormous. To discourage forays into modeling gambling behavior in nonhumans would seem imprudent.

Fortunately a nonhuman animal analogue of some aspects of pathological gambling-like behavior is quite possible. Consider a situation in which a rat is required to complete a large fixed ratio (e.g., FR 100) that results in a choice between pressing two levers. Pressing one lever results in the delivery of one food pellet with a probability of 1; Pressing the other lever results in the delivery of two food pellets with a probability of p. When p < .5, the rational long-term strategy is to exclusively select the smaller but certain option. A rat that continues to select the probabilistic option at lower values of p will lose more reinforcers than it gains, mimicking the situation of human pathological gamblers who continue to gamble despite mounting losses. Data from our lab show that rats experiencing this situation do, in fact, continue to “gamble” at values of p as low as .125. In fact, the rats will sometimes complete 40 FR 100’s while receiving as few as 4 pellets for their trouble. Kendall’s (1987, 1989) research also should be mentioned because it represents the first serious attempt to model gambling in nonhumans. He was critical of gambling analogues that lacked face validity (e.g., a simple variable-ratio schedule) and developed procedures with more similar features of human gambling.

That verbal behavior probably plays a causal role in the genesis and maintenance of gambling in certain cases is not disputed. The research by Dixon, Hayes, and Aban (2000) showing that instructions can result in persistence of gambling despite incurred loss is intriguing and could help explain many of the characteristics of ‘pathological’ gambling. That verbal behavior necessarily mediates all gambling however, goes beyond the data and diminishes/eliminates the role of nonhuman models of gambling. Also, the inclusion of verbal behavior does not solve the problem of individual differences. Indeed, the inclusion of verbal behavior will likely reveal another level of individual differences that have to be explained (such as why someone is more or less likely to follow a rule). Finally it should be recognized that explanations based upon verbal behavior can be just as ‘nebulous’ as those based upon reinforcement history, and one must still account for the reinforcement history that resulted in rule-following.

In conclusion, Weatherly and Dixon’s proposed framework is an approximation of a comprehensive account of gambling because it neglects several critical elements such as genetics, neurophysiology, Pavlovian conditioning and nonhuman animal models that are all necessary to understand the phenomenon. To be truly comprehensive, we should hedge our bets and cast our nets much wider.

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IN RESPONSE

AN INTEGRATIVE, NOT NECESSARILY COMPREHENSIVE, BEHAVIORAL MODEL OF GAMBLING

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The integrative behavioral model of gambling (Weatherly & Dixon, 2007) was forwarded as an initial attempt to provide a unified and coherent behavioral account for gambling behavior and problems. There were several reasons for making this attempt. For one, no such attempt had been made to date despite a large literature on gambling behavior existing outside behavioral psychology. A second reason was that such a model could serve as a springboard for researchers seeking external funding for their work, as funding agencies frequently prefer research proposals that are couched within a theoretical framework. Thirdly, proposing such a model could potentially spur research in support or in opposition of the model. Despite the excellent critiques and criticisms of the integrative behavioral model of gambling, each of our initial aims still has merit.

The commentaries found in this issue highlight a variety of topics that our paper raised. Some topical comments were critical, while others were complementary. In this response we will analyze each commentary individually, and conclude with a final synopsis of our position.

The commentary of Dymond and Whelan highlights what we believe is a critical feature of our model: verbal behavior. As Dymond and Whelan note, a direct contingency approach will only get us so far in understanding the complex human behavior of gambling. While animal models do in fact hold utility (see Petry, Madden, & Roll; Reilly & Fox), we do not believe that they can completely describe human behavior.

Dymond and Whelan suggest that one weakness in the proposed model is that we do not make clear our exact definition of verbal behavior. Failing to do so was not an oversight on our part, mostly because doing so would be a major undertaking in and of itself. For sake of brevity and to minimize controversy, we simply stated “verbal behavior.” No distinction was made between a Skinnerian (Skinner, 1957) or post-Skinnerian (Hayes, Barnes-Holmes, & Roche, 2002) definition of the term. While we would tend to side with the latter definition, as recent research suggests that such a definition holds utility to understanding choices gamblers make (e.g., Zlomke & Dixon, 2006), we did not want to limit our model to a certain set of pre-analytic assumptions. Although we agree with Dymond and Whelan that Skinner’s de-
nition is too broad for robust empirical re-
search, we leave the quibbling of the defini-
tion to the researchers and the findings that lie ahead.

Cooper as well as Reilly and Fox have noted that the jury is still out on the causal nature of delay discounting, and how discounting rates may be predictive of pathological gambling. We agree, and while Cooper’s quote of our manuscript is indeed correct, we would add that our intention was never to imply that a “cause” which determined pathology was an individual’s discounting of future delayed rewards. Instead, the preference for sooner smaller consequences, are a factor in a larger behavioral context that the person interacts within. Smaller rewards may be the low probability outcome of the gamble, avoiding paying of bills for more cash in-hand, or robbing a neighbor to finance the gamble. A behavioral repertoire consisting of repeated choices for sooner smaller less advantageous reinforcers that sustain gambling, we believe contributes to pathological gambling. Nothing in this argument is circular as noted by Reilly and Fox, and our use of the term “cause” was chosen for widespread readability rather than the perhaps more technically correct description of a participatory factor in an interbehavioral field of interaction between the organism and the environment. With the primary aim of our model being adoption outside behavior analysis, we see the latter, more precise description damaging to that primary aim.

Lyons raises two primary concerns with our model. The first is our implied minimized importance of intermittent reinforcement. The second is our suggested dismissal of reinforcement history. We believe that Lyons can rest assured that both are important to understanding the behavior of gambling from our perspective. There is no doubt that we value both intermittent reinforcement and a history of reinforcement in our model. Our point was never exclusion of these two variables in understanding gambling behavior, but rather emphasizing that they are by no means the exhaustive causes of the behavior. In response to Lyons’ question of the necessity of establishing operations such as age or socio-economic status in our model, we think that the data will be the best determiner of their inclusion. Large-group-design research has documented differences between factors such as age, socio-economic status, and race (see Petry, 2005 for a review). Whether changes such as age and financial statue within the life of an individual gambler makes a difference in mitigating their propensity to gamble; only the data will tell the tale. Lyons ends his commentary with the following question: “How do we account for individual differences in young, male, poor, single, drug-using minority members who do not become pathological gamblers, and older, female, married, abstinent white women who do?” He then answers his own question with: “The answer, I suspect, will have something to do with reinforcement history.” We have no argument with his answer to the question, as ours would be the same. The only modification we would have would be to emphasize the word “something”, as it is far from everything.

The commentary of Reilly and Fox mentioned that it was unclear in our paper if it was a description of pathological or non-pathological gambling. From our perspective, it is both. The only distinction between the two from our position is a matter of degree. Pathological gamblers are not a separate population, but rather simply those who engage in the behavior of gambling more often than those who do not or are not considered pathological gamblers. Rate alone is not exclusive of “pathology” as the outcomes of gambling on the rest of the individual’s life are important as well. The differences between the two groups are often categorical, but we would consider them quantitative in nature.

The final issue we wish to respond to is that of our potential over-emphasis on the role
of verbal behavior and thus a downplaying of programmed contingencies. Petry, Madden and Roll state with respect to differences between pathological and non-pathological gamblers that “Given these differences, the authors (Weatherly and Dixon) suggest that differential sensitivities to gambling contingencies of reinforcement are not in the environment but in human language.” This quote may in fact highlight a common misconception of human language – that language is not in the environment, but rather somewhere within the person him/herself. A similar concern was echoed by Lyons that somehow a choice needs to be made by theorists between the two variables: language and contingencies). We do not believe that such a choice is necessary. Language is behavior in the environment, and is developed, maintained, and extinguished via environmental contingencies, just like nonverbal behavior.

Pointing to the consequence of verbal behavior is more difficult than that of nonverbal behavior, but nonetheless, both are behavior maintained by the environment. Our embrace of the role of verbal behavior is not a dismissal of pure programmed contingency control. Instead, it is an acknowledgement of the complexity of human behavior. Dismissing verbal behavior in hopes of parsimony in explaining nonhuman behavior leads us further away from the goals of behavioral science – prediction and control. Petry et al. may doubt the strength of verbal rules or instruction to control the behavior of the gambler, as if they could, “then treating pathological gambling could be greatly simplified; therapists would simply instruct them to stop” (Petry et al.). We agree just telling someone to stop gambling will not solve the problem, as histories of rule following and contingency control are more complex and historical in nature than the current verbal utterance being emitted at that moment. However, if a lottery player continues to play week after week and has never won the lottery, appeals to programmed reinforcement for playing (i.e., winning) seem substantially inadequate. Thus, we believe that both the environmental consequences for rule following (social reinforcement from the speaker, more effective contact with the environment, or momentarily altering the reinforcing value of the consequence – see Hayes, 1987 for a full description of the various environmental consequences of rules) and the environmental consequences for non-verbal behavior are at play each and every time a gambler gambles.

We are hopeful that debates over these issues will be promoted, rather than ended, by our comments here. Clearly the behavioral perspective has much to offer in the way of understanding the very important issue of gambling behavior and pathological gambling. If our model can in any way forward that perspective, then we will consider it a success.

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THE ROLE OF “EXPERIENCE” WHEN PEOPLE GAMBLE ON THREE DIFFERENT VIDEO-POKER GAMES

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The present experiment was designed to determine if and how experience might alter individuals’ gambling when playing video poker. Twelve self-identified “experienced” poker players and 12 self-identified “novices” were recruited to play video poker across three different sessions. A different game (i.e., Jacks or Better, Bonus Poker, or Loose Deuces) was played in each session, with these games differing in what strategies were optimal. “Experienced” participants displayed more knowledge of poker than their “novice” counterparts. However, the only observed difference in the gambling between “experienced” and “novice” players was in how much they bet per hand, with “experienced” players betting higher amounts. Participants in both groups made frequent errors when playing, with error rates increasing when wild cards were introduced into the game. Self-reported strategies suggested that some participants held fallacious views about the games and/or betting strategies, although the presence of fallacious views did not appear to differ between groups. The present results indicate that experience may not necessarily lead to better play and, if anything, may be detrimental to the player if it leads to increased betting without an increase in the chance of winning. The results also suggest that, although players may alter their strategies when playing different poker games, they do not do so optimally.

Keywords: experience, video poker, gambling

Experience plays a major explanatory role within behavioral psychology. This concept falls under the guise of “reinforcement history” within a strict behavioral framework. The idea that experience is a critical aspect of understanding behavior, however, has not gone unnoticed in other fields of psychology. For instance, one can find large amounts of research conducted on the influence of “knowledge” or “expertise” on different types of behaviors. The study of how experience affects behavior has actually resulted in some of the more widely known research results in psychology. For example, de Groot (1965, 1966) attempted to identify the influence of expertise by comparing the behavior of expert chess players (e.g., grand masters) to that of novices (e.g., class A chess players). Both types of player were shown a chessboard on which pieces were arranged in a realistic manner such as one might find in a partially completed game. Participants were asked to identify the best move for the next turn given that arrangement of pieces. Perhaps surprisingly, players of both skill levels were fairly equivalent at identifying what the best move would be. The major difference between the different skill levels was the number of potential moves explored by the different players. The masters went through fewer possible derivations than the novices before concluding

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Perhaps more famous within the memory literature is a study by Chase and Simon (1973). These researchers found that chess grand masters were quite adept at recreating configurations of chess pieces from memory even when given only brief exposure to the original configuration. This ability, however, seemed to be connected to whether or not the pieces were configured realistically as one would find in an actual game of chess or had been arranged randomly. In fact, when shown configurations of pieces randomly placed on the board, the grand masters were no better than novices at recalling their positions. Such findings spurred a great deal of subsequent research, some of which has documented that, in some instances, expertise may actually be detrimental (e.g., Castel, McCabe, Roediger, & Heitman, 2007).

Within a cognitive framework, results from research on expertise have been interpreted in terms of cognitive processing and the organization of memory. Within a behavioral framework, however, they can be interpreted in terms of shaping and stimulus control. That is, one could speculate that the results of de Groot (1965, 1966) occurred because, through extensively playing against top-notch competition, experts’ behavior of going through certain progressions of potential moves has been reinforced while going through other progressions has either been extinguished or punished. Perhaps due to their lack of experience, novices may not discriminate between productive and non-productive progressions and thus may go through more of them.

Likewise, one could speculate that the results of Chase and Simon (1973) demonstrate that the configurations of chess pieces experienced by masters during actual play had come to serve as discriminative stimuli. Behavior such as recalling the position of the pieces was possible when the pieces were arranged in a particular fashion. The same behavior was inhibited, or at least not facilitated, when the pieces were differently arranged.

Both results have implications beyond chess play or the study of memory. They suggest that the behavior of game players are altered through continued play of the game. It is commonly assumed that this experience will enhance play. However, that is not necessarily the only possible outcome (e.g., Castel et al., 2007). For instance, one could speculate that chess players who continually play against lesser competition might have their behavior shaped in non-optimal ways. This non-optimal play would not be exposed until playing against a more advanced opponent. Likewise, it is possible that stimulus control would develop with continued game play, but that is no guarantee that the stimuli that come to exert control over behavior are the most optimal in terms of maximizing performance.

These possibilities take on added significance when applied to gambling on games of chance. Many games of chance (e.g., poker, blackjack, video poker) involve strategies that can enhance one’s chance of winning and/or minimize one’s chance of losing. One might assume that continued play at such games would shape appropriate strategies. However, that may not be the case. Because of the element of chance present in these games, proper decisions do not always result in winning. Likewise, poor or improper decisions would not always result in a loss. In fact, poor decisions might reduce the likelihood of winning, but would they would still result in the player winning at least intermittently. This intermittent reinforcement might in turn enhance the likelihood of poor decision making in the future. To our knowledge, research on these possibilities does not exist within the gambling literature.

It is therefore not clear that experience would necessarily equate to improved play across time. Likewise, some games of chance, such as poker and video poker, have many different variations that can be played.
These variations involve the identical or nearly identical stimuli (i.e., the same cards and winning card combinations). However, because different games might require different strategies for optimal play, performance may be inhibited if certain stimuli (e.g., card combinations) come to exert stimulus control over players' gambling behavior (e.g., promoting a certain play when dealt a specific type of poker hand). In short, although intuition would suggest that experience should enhance ability, it may actually inhibit it.

The present experiment was designed to assess if and how experience might influence gambling when participants played a video-poker simulation. Individuals who self-identified as “experienced” or “novice” poker players were recruited. These individuals were then staked with money to play three different versions of video poker across three separate sessions. All three games were variations of five-card draw, but differed in terms of what were the best cards to hold or discard on specific hands. If experience promotes play, then experienced players should outperform novice players. Furthermore, one might also predict that players with greater knowledge of the game of poker would alter their play across games as the odds, and thus the optimal strategy, changed. On the other hand, if experience does not necessarily shape the “optimal” pattern of play, then one might not expect experienced players to outperform novice players. Likewise, if players’ behavior is under the control of stimuli across the different games, then performance across games should differ because the same hands might require a different decision depending on which game was being played.

METHOD

Participants
Twenty four individuals were recruited from the psychology department participant pool at the University of North Dakota. Participant recruitment proceeded in two phases. The first phase recruited people who self-identified as “experienced” poker players (not limited to just video poker). This phase was initiated first because it was anticipated that it would be more difficult to recruit “experienced” players than “novices.” The second phase targeted individuals who self-identified as “novice” poker players.

For both phases, recruitment information was posted in the psychology department building that targeted individuals who were “experienced” or “novice,” respectively, poker players. No other poker-related information was presented beyond indicating the targeted level of experience for each group. To participate in either group, individuals were required to be at least 21 years of age and had to score below five on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987).

Twelve participants were recruited for each group (Experienced: 6 males, 6 females; Novice: 5 males, 7 females). The mean age of participants in the Experienced group was 28.17 years (SD = 5.70). The mean age of participants in the Novice group was 28.42 years (SD = 13.44).

Materials and Apparatus
All participants were asked to complete a demographic questionnaire during their participation. The questionnaire asked the participant’s sex, age, marital status, and annual income. This information was collected because research on gambling (see Petry, 2005) indicates that each of these factors is correlated to the presence of pathological gambling. The present procedure was designed to exclude pathological gamblers from participation. However, it remained possible that these factors could potentially be associated with differences in the gambling behavior of the “experienced” and “novice” participants and were therefore measured.

Participants were also asked to answer four questions meant to determine their familiarity
EXPERIENCE ON VIDEO POKER

with the game of poker. The four questions were (with answers in parentheses): What cards are necessary for a full house (Three cards of one face value and two cards of another face value)? What hands beat a full house (Straight flush, Four of a kind, & Royal flush)? What is a set (Three cards of one face value)? In a wild-card game, what is the best hand (a natural Royal flush)? These questions were meant to determine whether the self-identified experienced players differed in their knowledge of poker relative to the self-identified novice players. Participants’ answers to these questions did not alter to which group they had been assigned through self identification.

The next task was the SOGS (Lesieur & Blume, 1987). The SOGS is a 20-item questionnaire that focuses on the individual’s gambling history. It is the most widely used screening measure (see Petry, 2005), with a score of five or more on the SOGS suggesting the possible presence of pathological gambling. Participants who scored five or above were dismissed before the gambling session and their demographic data were not included in the data analyses. Dismissing these participants ensured that individuals with pathology were not allowed to engage in their pathology.

Lastly, after playing each type of poker game, participants were asked to provide a written response to the following statement: Please describe the strategy you used when playing the last game. No information on strategy was conveyed to the participant and the individual was afforded the opportunity to be as explicit or succinct as he or she deemed necessary.

Participants completed the above materials and played the video-poker game in windowless room that measured approximately 2 m by 2 m. The room contained a table and two chairs, with a personal computer situated on the table. The video-poker software (Zamzow Software Solutions, 2003) on the computer allowed for a variety of five-card-draw poker games to be played. The present experiment utilized three specific games. One (Jacks) was “Jacks or Better,” which returned the player’s bet for a pair of Jacks or higher. A Flush was paid at 6-1 odds, a Full house was paid at 9-1 odds, and a Four of a kind at 25-1 odds. The second game (Bonus) was “Bonus Poker,” which was similar to “Jacks or Better” with the exception that it returned 5-1 for a Flush and 8-1 for a Full house. It also paid three different amounts for Four of a kind, with 25-1 odds for Fives through Kings, 40-1 odds for Twos, Threes, and Fours, and 80-1 odds for Aces. The third game (Deuces) was “Loose Deuces,” which was five-card draw with Twos wild. This game required at least Three of a kind to return the player’s bet and included payouts for Five of a kind (15-1 odds), a Royal flush with Twos (25-1 odds), and Four twos (500-1 odds).

These specific games were chosen for two reasons. The first was that they sometimes differed in what was the “best play” when dealt the same hand of cards. For instance, if the player was dealt the 7 of diamonds, 8 of diamonds, Jack of diamonds, 9 of hearts, and the King of hearts, the best play would be to hold the 7, 8, and Jack if one is playing Jacks or Deuces. However, the best return on Bonus would come by holding the Jack and King. If the player was dealt the 10 of clubs, Jack of diamonds, Queen of diamonds, Ace of diamonds, and Ace of hearts, then the best play would be to hold the two Aces if one was playing Jacks or Bonus. However, the best return on Deuces would come if one held the Jack, Queen, and Ace of diamonds. In terms of similarity, the best play was most often the same between Jacks and Bonus. To play Deuces optimally, one would need to take an alternate strategy than with the other two games fairly frequently. The second reason was that these three games are commonly found in major commercial casinos in the United States. Thus, if one was an expe-
renced video poker play, it is reasonable to speculate that one might have played each type of game.

The software recorded the number of times during each session that the player deviated from the optimal play. The optimal play was the one which maximized the player’s rate of return given that particular hand. Non-optimal plays were recorded as errors. The software allowed for errors to be categorized from minor to major, depending on the deviation in rate of return from the optimal play. For purposes of the present study, however, plays were categorized as accurate (i.e., optimal play) or inaccurate (i.e., any play that was not optimal). Players were not notified as to what the best play was for a given hand or as to whether they had made the optimal choice. The only information provided to participants was the pay table that appeared on the screen above where the cards were displayed.

Procedure

Participants were run individually. Upon arrival, the researcher initiated the informed-consent process. Once the participant had provided consent, he or she was asked to complete the SOGS. Next, the participant was asked to complete the remaining forms while the researcher scored the SOGS. If the participant scored five or more on the SOGS, then the session ended after the forms were completed. In this event, which occurred once for a female participant recruited for the Experienced group, the participant was debriefed, given course extra credit (if applicable), and dismissed.

The researcher then situated the participant in front of the computer and read the following instructions:

You will now be given the opportunity to play a computer generated, five-card-draw poker game. You will be staked with 100 credits. Each credit is worth 5 cents. Thus, you are being staked with $5. You may bet up to five credits per play and your goal should be to end the session with as many credits as you can. You may quit (i.e., end the session) at any time by informing the researcher that you wish to end the session. The session will end when a) you quit playing, b) you reach 0 credits, or 15 minutes have elapsed. You will be paid in cash at the end of today’s session for the number of credits you have accumulated or have remaining. Do you have any questions?

Questions were answered by repeating the above instructions. The participant then played the video-poker game until one of the three criteria to end that session was met. The researcher then asked the participant to complete the form pertaining to the strategy the player had just used. During that time, the researcher readied the next type of game. The researcher then read the identical instructions. This process was repeated until the participant had played all three poker games and had completed the strategy forms after each. Upon completion, the participant was debriefed, paid, provided course extra credit (if applicable), and dismissed. The order that participants experienced the three different poker games varied randomly across participants.

RESULTS

Data from participants in each group were compared on the measures of age, marital status, annual income, SOGS score, and the number of poker-knowledge questions correctly answered. The only significant difference between the groups was observed with the poker knowledge questions \( F(1, 22) = 8.17, p = .001, \, \eta^2 = .374 \), with the participants in the experienced group answering significantly more questions correctly than participants in the novice group\(^1\). Results from these analyses, and all that follow, were considered significant at \( p < .05 \).

Figure 1 presents the results from the video-poker sessions. The graphs in Figure 1 did not take into account how sessions ended.
EXPERIENCE ON VIDEO POKER

That is, results were calculated across the entire session regardless of whether the session ended before or after 15 min. Sessions lasting less than 15 min occurred on at least 10 occasions because either participants had lost all 100 credits or because they chose to terminate the session. The majority of sessions, however, were 15 min in length.

The data in Figure 1 were analyzed by conducting a two-way (Experience by Game) multivariate mixed-model analysis of variance. In this analysis, poker experience served as the grouping factor and type of game served as the repeated measure. The four measures presented in Figure 1 were the dependent variables. In the omnibus analysis, both the main effect of experience (Pillai’s Trace = .453, $F(4, 19) = 3.93$, $p=.017$, $\eta^2=.453$) and game were significant (Pillai’s Trace = .640, $F(8, 15) = 3.33$, $p=.021$, $\eta^2=.640$). These results suggest that the experienced group played differently than the novice group and that both groups played differently across the three different games, respectively. The interaction between experience and game was not significant.

Follow-up univariate tests indicated that the main effect of experience was limited to the average bet size per hand (see second graph from bottom in Figure 1). Specifically, participants in the experienced group wagered more credits per hand than did participants in the novice group ($F(1, 22) = 12.92$, $p=.002$, $\eta^2=.370$). Of the other measures, only the total number of credits bet across the session approached statistical significance ($F(1, 22) = 2.78$, $p=.110$, $\eta^2=.112$).

Follow-up univariate tests indicated that the main effect of game was limited to the accuracy of play (see bottom graph in Figure 1; $F(2, 44) = 8.87$, $p=.001$, $\eta^2=.287$). Furthermore, the linear polynomial contrast was significant for this measure ($F(1, 22) = 23.14$, $p<.001$, $\eta^2=.513$), indicating that accuracy decreased across the Jacks, Bonus, and Deuces sessions, in that order.

Responses on the strategy questionnaires completed after each poker session were analyzed, but few participants provided much, if any, detailed information. Completed questionnaires were screened for accurate and inaccurate statements. Fallacious comments were sometimes observed and fell into two general categories, faulty betting strategies (e.g. “One time I bet 5 and lost, so I stopped doing that” or “When I noticed my luck was high, I would switch to betting 2 credits instead of one”) and a lack of understanding of the game (e.g., “I also started trying for bigger hands because they give a higher payout” or “I tried going for more advanced things like flushes, straights and full houses”). These latter comments are fallacious because what hands one attempts to obtain should be dictated by the cards one is dealt, not by the payoff table alone. Statistical analyses were conducted on the frequency counts of the number of participants in each group who reported fallacious strategies and the total number of fallacious comments per participant regarding their play in each session. No significant differences were found.

Most, but not all, participants in both groups expressed that they altered their strategy across the different games (e.g., “I didn’t keep as many face cards because two of a kind didn’t do anything”). Again, however, there were no statistically significant differences between the groups in that respect.

DISCUSSION

The present experiment was designed to investigate whether experienced poker players would play better (or differently) when
Figure 1. Presented are the means for each group on four different measures of behavior when playing each type of poker game. The error bars represent one standard error of the mean.
EXPERIENCE ON VIDEO POKER

playing video poker relative to inexperienced players. It was also designed to assess whether players would alter their playing strategies across games that required different strategies to play them perfectly. In some ways, the results were both intriguing and alarming. Experienced players did not play better than novice players. In fact, they only differed from novices in that they made larger bets than did the novices. Although the qualitative data suggest that players attempted to change strategies across the different games, these attempts did not optimize their chances of winning. Both experienced and novice poker players responded well below 100% accuracy, with the worst accuracy rates being observed when wild cards were introduced into the game.

One obvious criticism of the present study was that, although it recruited “experienced” poker players, the participants may not have been “expert” players. The fact that the experienced participants played no better than the novice participants clearly supports this criticism, as does the fact that the accuracy rate of the experienced players averaged less than 70% across the three games. In the present study, participants who self identified as “experienced” or “novice” poker players were placed in those respective groups without question before their poker knowledge was assessed. Thus, it is legitimate to believe that different results would have been observed if professional poker players (i.e., experts) had been recruited rather than self-identified experienced players. Indeed, past research that reported differences between experienced and inexperienced participants either used formalized criteria to delineate the different groups before (e.g., de Groot, 1965, 1966) or after (e.g., Castel et al., 2007) performance data were collected. The present study did neither and it is therefore possible that there was a sizeable overlap in skill between the groups.¹

These criticisms notwithstanding, the present results still have value. Participants in the “experienced” group self identified as experienced poker players and it seems reasonable to assume that they therefore believed that their “experience” made them different from novice players. Furthermore, the knowledge base of the experienced players did differ significantly from that of the novice players as measured by the four-item questionnaire administered during the session. Thus, although the present “experienced” participants may not have been poker experts, they did present themselves as experienced poker players and displayed an enhanced knowledge of the game relative to the novice players.

Unfortunately, these differences did not translate into superior play. Rather, experience only functioned to increase how much participants wagered per hand. There are several possible explanations for why this outcome was observed. One might be tied to knowledge level. It is the case that one’s chances of winning on each of the three games are maximized if one bets the maximum number of credits possible (i.e., 5) versus any other amount (see below for an explanation). It is possible that “experienced” players recognized this fact. However, this explanation can be questioned. Although experienced players had a significantly higher average bet size than the novice players, the experienced players still averaged well below the maximum bet size (which is needed to maximize the chances of winning). Furthermore, the self reports of strategies used did not provide a single instance in which a player identified that it was in his or her best interest to bet the maximum number of credits.

A second possibility is that participants’ experience served to enhance their confidence in winning and therefore they wagered more money per hand than did novice participants. In behavioral terms, experience may have served as a setting event (Kantor & Smith, 1975). Setting events are conditions that alter the reinforcing consequences of a behavior on a relatively permanent basis. It is possible
that experience did so by altering the consequences associated with betting.

A third, but not last, possibility is that experienced participants have habituated (Thompson & Spencer, 1966) to betting small amounts. This process would lead experienced players to bet larger and larger amounts to achieve the same level of stimulation as before. The present study did not ascertain why participants bet the number of tokens per hand that they did, so each of these possibilities remain open.

The failure to find a difference between experienced and novice players in accuracy of play is partially consistent with the results of de Groot (1965, 1966), who found that expert and non-expert chess players would often come to the same decision on which play to make. However, de Groot reported that experts did so more quickly (or at least explored fewer alternatives) than non-experts. This latter finding was absent in the present data. If the experienced players made decisions more quickly than the novice players, then one would predict that they would have been able to play more hands per session than the novices. That was not the case. The difference in the number of hands played was not significant and, if anything, the experienced players averaged fewer hands per session than the novice players. De Groot also reported that both experts and novices ultimately came to a good decision. That was often not the case in the present experiment, as both experienced and novice players made frequent mistakes.

Failing to show that experience had a positive impact on video-poker play has some negative implications. If experience does not enhance play, but rather makes people more likely to wager more money, then gaining experience may not be in the gambler’s best interest. Risking larger and larger sums of money without a concomitant increase in the probability of winning may in fact promote pathology. Future research should attempt to assess the reliability of the present findings in this regard. That research should also attempt to explore the mechanism that potentially leads to increases in bet size with experience.

The second question asked by the present study was whether players’ behavior would be differentially controlled by the different games or whether players would play similarly across the different games. Qualitative responses suggest that players noted the different contingencies of the different games and altered their strategies. However, the quantitative data suggest that players either did not alter their strategies (and thus their accuracy varied across the games) or altered them inappropriately. That is, accuracy rates were quite low, again averaging less than 70% for all three games.

One could potentially argue that this particular outcome was influenced by the fact that, although participants were gambling with actual money, it was not their own money and therefore they did not take the time or effort to play well. This criticism cannot be completely refuted. However, there is at least one argument against it. Specifically, previous research on the “endowment effect” has demonstrated that when people are gifted something, they take ownership of it and are negatively impacted by its loss (e.g., Kahneman, Knetsch, & Thaler, 1990). None of the present participants expressed surprise when paid cash at the end of the experiment. That outcome suggests participants were aware that they were playing with real money, which should have promoted the endowment effect. However, to fully answer this criticism, one would need to conduct the experiment with participants risking their own money. For ethical reasons, such a replication is unlikely. Given ethical constraints, the present procedure appears to be as close to actual gambling as possible in the laboratory.

The fact that participants performed so poorly when playing is troublesome, especially given that video poker is touted (accurately
As one of the most gambler-friendly games in a casino (e.g., see VideoPokerAdvisor.com), Video Poker was indeed the case in the present study. If participants had played perfectly and bet five credits per play (which raises one’s overall chances because the Royal flush pays above the standard multiplier when one places the maximum bet), their rate of return would have been 99.54, 99.17, and 100.97% for the Jacks-or-Better, Bonus Poker, and Loose Deuces games, respectively. Played perfectly for an indefinite period, Loose Deuces is not gambling; it is investing. However, participants played far from perfectly and actually played the most inaccurately when playing Loose Deuces.

Generalizing laboratory results to naturally occurring situations should always be done with caution. However, if allowed to generalize the present results to a casino setting, one would surmise that it would be in the casino’s best interest to provide patrons with experience playing its games even if it comes at an initial cost to the casino (e.g., staking players with house money, sponsoring low-cost or free “tournaments”). Doing so would promote increased wagers in the future that come with “experience.” It would also be in the best interest of the casino to introduce variations of games players are already familiar with but that require different strategies for accurate play. Even though players might alter their strategies when playing these new games, they are unlikely to do so optimally. For readers familiar with casinos, these generalizations are not likely to seem far fetched. They are standard practice at many major casinos.

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THE GAMBLING FUNCTIONAL ASSESSMENT (GFA): AN ASSESSMENT DEVICE FOR IDENTIFICATION OF THE MAINTAINING VARIABLES OF PATHOLOGICAL GAMBLING

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The present paper describes the rationale and presents an assessment device for the identification of functional control of pathological gambling behavior. It is suggested in this paper that only through identification of function and eventual treatment based on such function will interventions for the treatment of pathological gamblers become successful. A 20-item self-report format assessment is presented along with the scoring key for the instrument. Suggestions for future research on the psychometrics of the proposed instrument are presented along with implications for use in both research and clinical treatment facilities.

Keywords: gambling, assessment, pathological gambling, addiction, self-report, interview

Treatment of pathological gambling ranges from exclusive reliance upon medications (e.g., Kim, Grant, Adson, Shin, & Zaninelli, 2002) to traditional talk-therapy (e.g., Petry et al., 2006; Ladouceur et al., 2001). Regardless of the type of intervention attempted with a pathological gambler, a first step in the process is the identification of the severity of gambling by a given individual. A variety of assessment devices are available that screen individuals for the potential of being a pathological gambler (e.g. Kim, Grant, Adson & Young, 2001; Johnson, Hamer, & Nora, 1998; Shaffer, LaBrie, Scanlan, & Cummings, 1994).

Perhaps the most commonly used instrument is the South Oaks Gambling Screen (SOGS; Lesieur, & Blume, 1987). The SOGS is a 20-item paper and pencil questionnaire designed to identify potential pathological gamblers. A score of 5 or above indicates a probable pathological gambler. The SOGS has reported measures of reliability and validity, and is often used as a screening instrument to indicate potential pathological gambling. Another commonly reported assessment device is the DSM-IVTR criteria (American Psychiatric Association [APA], 2000). The DSM-IVTR classifies pathological gambling as an impulse control disorder characterized by obsession with gambling, and the need to risk more and more money in order to reach previous levels of excitement. This latter assessment is commonly used for billing purposes by therapists to insurance companies for reimbursement.

Beyond the logical importance in therapy, the identification of potential pathological gamblers is useful in research protocols as well. Research on gambling behavior may use the clinical population of interest in cer-
tain experiments and perhaps compare them to a control group of non-pathological gamblers. Other research might explore how certain gambling tasks are approached or avoided dependent on the extent of pathology demonstrated by a known gambler. Regardless of the experiment, researchers need to carefully assess and report the attributes of their subject population. Identification of severity of a gambling disorder is one such characteristic.

However, identification of existence of the disorder, or describing behaviors that are indicative of maladaptation, is only the first step. Once the known pathology is identified, further assessment of what controls or sustains the pathology appears to warrant investigation. Behavioral treatments for pathological gamblers (e.g., Petry, 2005) differ from non-behavioral treatments through their use of an individual, client-specific approach that addresses that specific client’s causes for gambling. The function sustaining gambling, while perhaps different for each individual, will tend to center around one of four types of controlling variables: attention, escape, sensory, or tangible. While combinations may be possible, the relative contributing function(s) would be of different intensities. When maintained by attention, a pathological gambler may gamble in order to be around his friends or he may find himself comforted by the disappointment and unconditional love his wife repeatedly shows upon hearing about his gambling losses. In other words, his gambling may be maintained by the attention of others. Or a gambler may gamble as a way to escape from a stressful workday or cope with problems in her personal life. Playing the game takes all the trouble away. In this instance, the gambling behavior may serve an escape function. Alternatively, a gambler may gamble for the rush, the thrill, and the excitement it brings. Thrill seeking in this way could be considered gambling that is maintained by sensory experiences. Finally, a gambler may gamble simply because of the money she likes to win, the complementary perks she receives at the casino, or the free trip to Las Vegas. Here gambling may be maintained by access to the tangible items associated with the gaming experience.

Functional control of a targeted behavior of interest has been assessed within the field of behavior analysis for many years (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). Functional assessments may take the form of direct observation (e.g., Millichap et al., 2003), structured interviews (e.g., Kinch, Lewis-Palmer, Hagan-Burke, & Sugai, 2001), and experimental environmental manipulations (Iwata et al., 1994). Perhaps the most easily administered form of functional assessment is the questionnaire (e.g., Durand & Crimmings, 1988). Using a simple pencil and paper task of ranking a variety of sentence-structure items in terms of their relevance to the targeted behavior of interest, the behavior analyst can quickly compute a potential function which maintains that behavior.

While functional assessment questionnaires have been utilized for a number of years in the field of aberrant behavior of persons with developmental disabilities, they are of minimal use for the assessment of pathological gambling because the structure of the questions are not relevant for exploring gambling activity. For example, an item on the Motivation Assessment Scale asks “does this behavior occur when you take away a favorite object, activity or food?” (Durand & Crimmings, 1988). This question is clearly designed for a relevant other of an individual with developmental disabilities to answer. Such questions do not translate directly to a gambling context. Thus, it appears that a
Gambling Functional Assessment

Answer the questions below using the provided scale.

Write the corresponding number next to each question.

Never | Almost | Seldom | Half the Time | Usually | Almost | Always
0 | 1 | 2 | 3 | 4 | 5 | 6

1. I tend to gamble most frequently when there is nothing else going on or I have nothing better to do. ____
2. I really enjoy the complementary perks that come along with gambling, like free points, drinks, comp coupons, etc. ____
3. I enjoy the social aspects of gambling such as being with my friends or being around other people who are having a good time and cheering me on. ____
4. I often gamble after fighting with my spouse or significant other. ____
5. I feel more alive when I am gambling than when I am doing other types of activities. ____
6. Even if I lose, I can always count on a friend/loved one to help me through this difficult time ____
7. I often gamble when I feel stressed or anxious. ____
8. After I gamble, I like to go out and celebrate my winnings with others. ____
9. When I gamble, I like to accumulate points at a casino so they will offer me incentives and bonuses ____
10. I like the sounds, the lights, and the excitement that often go along with gambling. ____
11. I gamble to get a break from work or other difficult tasks. ____
12. If it were not for the ability to win a bunch of money, I would probably not gamble much at all. ____
13. I only gamble when my friends are gambling with me. ____
14. I often gamble when I am feeling depressed or sad. ____
15. I find myself feeling a rush, and getting excited when I gamble. ____
16. After I gamble, I often find comfort from other people to help me deal with my losses ____
17. If I have a hard day at work, I am likely to gamble. ____
18. I gamble more often when I have been offered complementary drinks, hotel rooms or other items. ____
19. When I gamble, I am often unaware of my surroundings. ____
20. I gamble primarily for the money that I can win. ____

Figure 1. The Gambling Functional Assessment (GFA).
Gambling Functional Assessment: Scoring

Write the number for each question in the following columns. The total score is the total score for each column. Circle the column with the highest total score.

<table>
<thead>
<tr>
<th>Sensory</th>
<th>Escape</th>
<th>Attention</th>
<th>Tangible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ______</td>
<td>4. ______</td>
<td>3. ______</td>
<td>2. ______</td>
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<tr>
<td>5. ______</td>
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<td>19. ______</td>
<td>17. ______</td>
<td>16. ______</td>
<td>20. ______</td>
</tr>
</tbody>
</table>

Total Score: __________________ | __________________ | __________________ | __________________ |

Figure 2. Scoring sheet for the GFA.

A questionnaire designed to identify potential controlling variables maintaining gambling would be useful and perhaps yield additional insight into treatment strategy. Also, researchers interested in the use of pathological gamblers may wish to gain additional means of ensuring a homogenous subject pool.

Therefore the purpose of the present paper is to describe an assessment instrument for the identification of potential functions of pathological gambling. Instructions for the scoring of the instrument are also included.

INSTRUMENT OVERVIEW AND QUESTION RATIONALE

The Gambling Functional Assessment (GFA) is a 20-item instrument that requires the person or the interviewer/clinician/experimenter to read a single sentence and respond in accordance with the degree to which the statement applies to the individual of interest’s gambling behavior on a scale from 0 or “Never” to 6 “Always”. The seven choice options include Never, Almost Never, Seldom, Half the Time, Usually, Almost Always and Always. Each option is associated with a number and the selected number is placed in an underlined space immediately following each question. Figure 1 displays a copy of the GFA. Of the 20 questions, five questions address one of four possible functions maintaining pathological gambling (attention, escape, sensory, or tangible). Randomized in order of presentation across every four questions, the various function-specific questions can be answered in approximately 5 minutes. Once the instrument is completed, scoring is conducted by placing the numbers reported for each of the 20 questions in respective columns shown in Figure 2. The columns are then summed and the column with the largest total suggests the primary function for the individual’s gambling behavior.

DISCUSSION

Identification of potential functions of gambling behavior would be beneficial to the practitioner and researcher alike. For the researcher, such identification would allow more insight into the characteristics of his participants. For example, it might be the case that gamblers whose gambling behavior is maintained by sensory experiences may react to the experiment one way, while gamblers whose gambling behavior is maintained
by social attention may respond another way. Also, by identifying the function gambling serves beforehand, researchers could assign their participants to groups in a more homogenous manner.

For the practitioner, such identification could potentially lead to more effective therapy. Such identification would allow the therapist to individualized treatment according to the behavior function. For example, if gambling behavior maintained by escape is indicated, the therapist could arrange a therapy program that focuses on developing other ways to cope with stress. Currently, the most empirically supported treatment for pathological gamblers is an 8-week individual Cognitive Behavioral Therapy program designed by Petry (2005). The second week in this program is devoted to a descriptive analysis of the functions of the individual’s gambling behavior. The gambler is encouraged to identify triggers for their gambling as well as the positive and negative consequences of such behavior. The therapist then uses this descriptive analysis to individualize the treatment. The GFA could assist the clinician in verifying the possible functions of the gambling behavior and tailoring the treatment from the beginning of treatment.

While the GFA may have potential clinical utility, more research is needed to test the reliability and validity of this instrument. The test-retest reliability should be examined as well as the internal consistency. However, it is important to note that the reliability and validity of most of the other functional assessment questionnaires have not been examined and yet, these questionnaires have been shown to have some clinical utility. Until this research has been conducted, the GFA should serve as the beginning toward understanding potential function, and should not be viewed as the final product upon which we should govern clinical decision making.

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TREATMENT OF COMPULSIVE GAMBLING

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A program for treatment of compulsive gambling is presented. The participant in the study was a 27-year old teacher. Before the treatment started he spent about $3,700 a month and his debt because of gambling was 60,000 dollars. The procedure included different parts; self-recording, establishment of alternative and incompatible behavior, relapse prevention and restrictions in access to money. To ensure that it was not the prevention from the access to money that stopped the use of money spent on gambling, thus, a couple of days every month participant had access to a certain amount of money. After the start of the treatment he has not lost or spent any money on gambling for nearly two years.

Keywords: compulsive gambling, treatment, self-recording, relapse prevention

A search in the PsycINFO database gave 1341 publications including search words as compulsive gambling or pathological gambling. Furthermore, over the past years there has been an enormous increase in gambling, particularly in the Western world, and mainly in games such as lottery, slot machines, scratch tickets, and sports betting (Ladouceur, 1996). Studies from the US have shown that 6.2% of visits to a general practitioner were brought on by compulsive gambling (Pasternak & Fleming, 1999). In addition, there has been a liberal attitude toward gambling in the sense that several different games have been legalized (Beconã, 1996), and Norway has been one of the most liberal countries concerning slot machines, which have also proved to be the most dependence-producing game (Fekjar, 2001).

The most used assessment tool for compulsive gambling is South Oaks Gambling Screen (Lesieur & Blume, 1987), which is a 20-question instrument for evaluating pathologic gambling in patients. Pathological gambling was officially recognized in 1980 with the publication of the DSM III and classified as an impulsive control disorder (Sylvain, Ladouceur, & Boisvert, 1997). One specific aspect of impulsiveness measured behaviorally is the inability to tolerate long delays to the reinforcer presentation, or preference for smaller immediate rewards over larger but more delayed rewards (Logue, 1995).

Petry (2005) has used a continuum of gambling, that is, Level 0 – 3. Anyone characterized at Level 0 gambling have not gambled at all. Level 1 gambling is characterized by gambling which not make any significant problems, while both Level 2 and 3 results in significant problems for the individual gambler and his or her family. Labels often used for Level 2 gambling are such as at-risk gambling and problem

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50
gambling, and Level 3 gambling is called compulsive gambling. Anyone characterized as Level 3 gamblers do engage in gambling in a way that impedes daily functioning (for details see American Psychiatric Association, 1994).

It is calculated that 84 to 92% of adults take part in different types of games (Volberg, 1994). Lately, pathological gambling has increased and the accompanying problems have been far-reaching (Freidenberg, Blanchard, Wulfert, & Malta, 2002). Actually, Petry (2005) points out there are only four studies which have studied the prevalence rate of compulsive gambling for the whole population of USA. Thus, in the US those prevalence studies have shown that 0.1 – 1.9 % are Level 3 gamblers and the lifetime percent is 0.8- 4.0%. For Level 2 gamblers it is from 0.4 to 3.6 % and the lifetime percent is varying from 1.3 to 7.5. It is important to note that the instrument uses in these studies differs and that one study is meta-analysis study (Shaffer, Hall, & Vander Bilt, 1999). In the meta-analysis of prevalence concluded that approximately 1.6% of US adults may be pathological gamblers, while 3.9% may be problematic gamblers, bringing the combined percentage of disordered gamblers to more than 5% (Shaffer et al., 1999). In the Canadian population the numbers are 0.8 – 1.7% for lifetime rates (Ladouceur, 1996). In Scandinavia, and countries like Sweden and Norway, the rates for Sweden are 0.6 for the current prevalence percent and 1.2 the for lifetime rate, Level 3 gambling respectively (Volberg, Abbott, Ronnberg, & Munck, 2001). In Norway the current percent of Level 3 gambling is 0.15, while lifetime rates is not stated (Gotestam & Johansson, 2003). It is important to mention there are no legal casinos in Norway, but you can of course play online casino and the online casinos are allowed as long as the server is not located in Norway.

There is a correlation between substance user problems and gambling behavior compared with the general population (Petry, 2005). Studies have shown that psychiatric comorbidity is common among pathological gamblers and is associated with greater severity if other clinical problems (Crockford & el-Guebaly, 1998; Ibáñez et al., 2001). For example substance dependency, anxiety symptoms, personality disorder has been referred to as such, but it is not clear the relation and timing between the comorbid psychiatric conditions. Stewart and Kushner (2005) are discussing three possible relations regarding the comorbidity between gambling and alcohol disorder, for example, gambling disorder causes the alcohol use, excessive drinking causes the gambling behavior, or there is no causal relationship between drinking and gambling, but third variable that are causally related to both gambling and drinking.

Studies which have compared compulsive gambling and addiction conclude that the results are more successful in the treatment of compulsive gambling than addiction, even if the costs of treatment are lesser (Lopez Viets & Miller, 1997). It has been argued that this could be connected to the fact that compulsive gambling is a more limited problem (Fekjar, 2001).

Prevalence has been shown to increase as a function of the opportunities for gambling (Pasternak & Fleming, 1999). Thus, it has been shown that, in the US, there is an increased density of organizations for anonymous gamblers in states where there are legal casinos (Lester, 1994). It has also been found that, in different states in the US, the prevalence of gambling increased after casinos were opened (Pasternak & Fleming, 1999).

It has been argued that an early diagnosis leads to better outcomes, but generally there has been little international research on treatment of compulsive gambling (Pasternak
& Fleming, 1999), and in Norway, the treatment offered has been minimal, even though in this country the number of people involved in gambling per capita is much higher than in neighboring countries (Fekjar, 2001).

There are still many questions unanswered regarding compulsive gambling, amongst them the question of best practice for treating pathological gambling, whilst one have to take in account that it is a new area of research (Petry, 2005). Although early treatments for pathological gambling were psychoanalytical in nature, short-term behavioral interventions have been more common (Toneatto & Sobell, 1990). Thus, most of the efficacy research has focused on cognitive therapy, cognitive behavior therapy and behavior therapy (Lopez Viets & Miller, 1997). Specific techniques which have been used are aversive techniques (Barker & Miller, 1966, 1968; Cotler, 1971; Goorney, 1968; Seager, Pokorny, & Black, 1966), stimulus satiation (Peck & Ashcroft as cited in Dickerson & Weeks, 1979), changing stimulus control and response prevention (Echeburúa, Fernandez-Montalvo, & Baez, 2000), imaginal desensitization therapy (McConaghy, Blaszczynski, & Allcock, 1991) or imaginal relaxation (McConaghy, Armstrong, Blaszczynski, & Allcock, 1988). Group counseling, used to help individuals in overcoming difficulties associated with problem gambling behavior (Coman, Evans, & Burrows, 2002), has been a widely used method in Norway, and we wished to explore the knowledge of the treatment of compulsive gambling by using principles from behavior and also study both the immediate and long-lasting effects. An obvious thing to do will be to get the participants engaged in other activities so this will compete with time spent on the gambling activity. Within behavior analysis some of the differential reinforcement procedures are examples of such a strategy. Differential reinforcement procedures as DRI (differential reinforcement of incompatible behavior) and DRA (differential reinforcement of alternative behavior) have been showed to be effective for various behavior problems. For example have DRA procedures been used to reduce aggression by increasing alternative types of behavior (Roane, Fisher, Sgro, Falcomata, & Pabico, 2004), decrease problem behavior (escape from demands) and increase compliance behavior (Reed, Ringdahl, Wacker, Barretto, & Andelman, 2005) or increase alternatively self-self restrictive behavior and reduce self-injurious behavior (Lerman, Iwata, Smith, & Vollmer, 1994). Likewise, DRI have been used in reducing excessive alcohol consumption (Glindemann, Ehrhart, Drake, & Geller, 2007), reducing maladaptive behavior (Spira, Koven, & Edelstein, 2004), self-injurious behavior (Tarpley & Schroeder, 1979), or increasing appropriate verbal behavior (Arntzen, Ro Tonnessen, & Brouwer, 2006; Dixon et al., 2004). As far as we know, such procedures have not been used in treating gambling behavior. The purpose of the current study was to have the participant to be engaged in other activities and to establish some new types of behavior that could compete with the gambling behavior by using procedures as differential reinforcement of incompatible and alternative behavior. We also want to include a measure of pulse.

**METHOD**

**Participant**

The participant was a 26-year-old man at the start of the treatment who volunteered to be a part of the current study. He was qualified as a teacher, and worked as a therapist in a group-home for people with developmental disabilities. He had a spotless reputation and no criminal record. His parents divorced when he was five. His pathological gambling problems were first discovered by others in 1997 when he was in the Norwegian
army and when he left the army he was diagnosed as a “pathological gambler” by a psychologist. Later the same year, he had consultations with another psychologist at a psychiatric county hospital. During the five-year period from 97-02, he also had several meetings with medical doctors and social workers, but at no point did the treatment have any significant impact on his gambling behavior.

When we started the treatment he responded in accord with description of Level 3 gambling and the DSM IV criteria for pathological gambling. Regarding comorbidity the participant showed no form of other psychiatric problems or substance abuse. He was mostly involved in sports betting and slot machines. When the procedures were implemented for the first time, his debt because of gambling was about 60,000 dollars. In comparison with this, his total income for the same period of time was about 120,000 dollars.

**Apparatus and setting**

In the study, a Polar s 610 watch was used to measure pulse in settings that from experience had often led to gambling. The data were saved in the watch.

**Baseline**

Recordings were based on bank statements.

**Procedure**

When we started the procedure, he had been hospitalized because of problems related to his compulsive gambling. During the current study, the participant worked with the psychologist, the first author, in sessions every second week for the first year and then monthly meetings for last part of study. In addition the participant and the psychologist had frequently contact by telephone and e-mail, for example the participant e-mailed data once a week. A therapist, the second author, also took part in these meetings. In addition to this, the participant also had weekly meetings with the second author to maintain continuity in the study. The procedure itself consisted of different parts:

**Self-monitoring.**

The participant was instructed from the start of the procedure to do self-recording of different aspects of his gambling behavior since these types of activities were difficult for others to record. He was given the rationale for doing self-recording and how to record the number of gambling instances, the amount of money spent on gambling, and the duration of each gambling sequence.

**Restriction of access to money beyond a certain amount.**

The reason for this was first of all that his income should be used to service the debt and of course to reduce the probability for gambling. In the beginning (June 2002), we agreed that the he should not have access to much money at any time, so we arranged with his bank that the second author should administrate the money. In this way he could fulfill the requirements of the debt restructuring arrangement. The administration by the second author was terminated in January 2004, and from that moment on, the participant himself fulfilled the requirements of the debt restructuring arrangement.

**Incompatible and alternative behavior.**

Work out in a fitness studio and a study-group in behavior analysis were used to establish different types of incompatible and alternative behavior, in addition, activities like these would compete with the time earlier used on gambling. In the study-group different basic terms in behavior analysis were discussed. Summaries of the recordings from the work out sessions and the activity in the study-group were sent by e-mail (as mentioned above) and presented during the
consultations as mentioned earlier and social reinforcers were presented on service the debt, doing work out at the fitness studio and for taking part in the study-group and especially for doing work out natural reinforcers maintained that behavior.

Relapse prevention.

The possibility of relapse was discussed to make the participant aware of high-risk situations and the possible reasons for returning to gambling. Principles such as intermittent reinforcement, vicarious reinforcement, and stimulus control were explained and it was discussed how these could be applied to the current situation. It must be taken in account that the participant had some competence in behavior analysis since he was working with people with developmental disabilities and also that these matters were discussed in the sessions in the study-group.

Pulse measures.

Two months after the self-monitoring had started he began to measure pulse in front of slot machines. The participant visited places where he earlier had used slot machines and just stands there, without using the slot machines, for 10 minutes and recorded the pulse. In 10% of the instances the second author was present and assisted in the recording. The pulse measure part of the procedure lasted for 6 months.

Test probes

To ensure that it was not lack of access to money alone that stopped the gambling, we introduced test probes from March 2003 in which the participant was given access to a certain amount of money, on average 3900 dollars, a couple of days every month (ordinary pay days).

Treatment integrity

The participant self-monitored gambling behavior, the work out and the study-group sessions during the current study and the recordings of these activities showed us if and when actually self-monitored.

Design

The results in the current study are presented in an AB design and for such a design there are of course threats against internal validity (see for example Shadish, Cook, & Campbell, 2002). On the other hand, case studies as the current study could be improved by including specific elements (Kazdin, 1981) and will be discussed later.

RESULTS AND DISCUSSION

Figure 1 shows money lost on gambling from January 2002 until May 2004. During baseline, the participant lost on average $3703 to gambling per month, and, anecdotally, the amount of money spent on gambling was probably at least four times higher than the amount the participant had lost on gambling. After the treatment started, the amount of money drastically decreased, and from August 2002 until May 2004, he had not lost or even used any money on gambling, not even on the days each month, time windows, when he had access to a certain amount of money (test probes).

The measures of pulse showed a reduction from 115 to 89 after a week and stayed at a mean of 89 for the rest of the recording period, six months. It could be assumed that the value had been higher if we had started the measure of pulse from the beginning or even during baseline. These data could not be emphasized very much since we have not such recordings during baseline and not from the start of the treatment, but is presented because it could be an important type of data to include in future research.

In addition to this, quality of life in general has increased for him. He eats more regular meals, his physical condition has improved
Figure 1. The Figure shows amount lost on gambling per month during baseline and the amount of money spent or lost on gambling during the treatment.

because of the work out and his bills are always paid on time. He also takes part in social activities with friends, and pays his family more regular visits. Because of money saved since he is not gambling, he has also been on several journeys abroad during the past six months.

The procedures used in the current study are in accord with the assumption that it is important to construct an alternative behavioral repertoire (Sharpe, 1998). It is also important to explain in detail about reinforcement and reinforcement schedules, thus, as many researchers have argued that an inaccurate view of the notion of randomness is the fundamental mistake made by gamblers (Ladouceur, 1996; Ladouceur, Sylvain, Boutin, & Doucet, 2002; Sylvain et al., 1997), so that’s the reason why we spent so much time discussing this with the participant. Moreover, the numbers of studies reporting long-term maintenance have not been encouraging (Echeburúa, Fernandez-Montalvo, & Baez, 2001). In the present study, we have shown encouraging long-term effects of the behavioral treatment.

The time windows when the participant had access to a greater amount of money the bank account showed the money were either used to pay off debt or not used at all. This means the money available was not used for gambling, and that it was most probably not the restriction in access to money per se that stopped him from gambling, but rather the engagement in types of alternative or incompatible behavior that had competed with the gambling behavior. The last months, from January 2004 to June 2004, there was no
restriction to the access to his money, and as shown in Figure 1 there was no instances of gambling during this period.

Rather few treatment programs have been developed to help pathological gamblers, furthermore many programs suffer from methodological flaws and few have used interventions based on empirically validated theories (Sylvain et al., 1997). A search of the PsycInfo database using the search words pathological gambling + behavior therapy or behavior modification gave 32 hits, thus, both behavior therapy and cognitive behavior therapy were listed, and even more interesting, pathological gambling + behavior analysis gave no hits. We wished to explore the efficacy of using principles from behavioral analysis in treating compulsive gambling. Furthermore, on basis of the notion that therapists seldom use purely behavioral treatments and instead more traditional “talk therapy” (Petry, 2005), we thought it was very interesting to expand the knowledge of applied behavior analysis in treating compulsive gambling.

There are of course pitfalls in using bank statements as data in a study with compulsive gambling. It could still be possible for the participant to gamble with money borrowed from others. In this case the participant had already borrowed so much money from friends and family that nobody would give him any more money, and in addition he would not get money from credit companies, so we still think that the bank statements give a correct picture.

Self-monitoring has been used in a number of cases that only the participant could observe and record, and later self-monitoring has become an intervention in its own right because of the reactive effects (Cooper, Heron, & Heward, 2007). Therefore, we found it necessary to use this strategy in the current study. Regarding treatment integrity we have recordings of the participant’s self-monitoring of gambling behavior, from the work out in the fitness studio, and in the study-group the second author was one of the participants, so we have some control for the validity of data.

The social validity in the current study must be assumed to be reasonably high, but it could be argued that the experimental control is rather low, as the treatment consisted of different procedures and because in such studies it is complicated to measure reliability, at least during baseline. An AB design can of course not replace experimentation, but in some cases it is difficult if not impossible to use a reversal design, multiple baseline design or any other experiment design. We considered it to be unethical to use a reversal design in the current study and it seem difficult to use a multiple baseline design. On the other hand, according to Kazdin (1981) there are some features which could strengthen the possibilities to draw valid inferences from case studies. First, the fact we have presented objective data and not anecdotal data (which could be the case in case studies). Second, that we have assessed data continuously and not used pre and posttests. Third, that gambling behavior has been a part of the participant’s repertoire a long time before we started the treatment and it is not probable that the gambling behavior would have changed if we hadn’t started the intervention. Because of the three conditions just mentioned, there is support for the notion that the intervention may have led to the changes observed in the current study.

In conclusion, the procedure used in the current study has proved to be effective in reducing compulsive gambling in a 27-year-old male. The results have also shown maintained treatment effects nearly two years after the start of the treatment.

**REFERENCES**


USING WINPOKER 6.0 TO STUDY GAMBLING BEHAVIOR

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Previous technical efforts have described how custom computer programs for the study of gambling behavior may be created to allow for the manipulation of variables not readily available in natural gambling contexts, however many people may lack the technical repertoires necessary to make such efforts feasible. The current paper discusses how a commercially available Video-Poker simulation and training software package, WinPoker 6.0, may be employed to study gambling behavior.

Keywords: video-poker, computer software, WinPoker 6.0, gambling

It is difficult to ignore the growing emergence of gambling activity in our culture at large in recent years. Over the past three decades an increase in the legalization of gambling in some form throughout the US has been observed, with now 48 states offering some type of legal wagering, where 30 years ago only two did (Ghezzi, Lyons, & Dixon 2000). Advances in technology, namely the Internet, have also increased accessibility and familiarity with gaming activities for most individuals (Griffiths, 1999; Griffiths & Parke, 2002). In addition, increasing television coverage of gambling activities such as the World Series of Poker on ESPN or the World Poker Tour on the Travel Channel could be moving traditional viewpoints of gambling from a harmless vice or recreational activity to an accepted form of sport (Wilstein, 2005). This increasing popularity and acceptance does not come without a price however, with reports of the rate of pathological gambling at between 1-2% of the population worldwide (Petry 2005).

While in relative terms this may seem like a small number, it represents millions of people who fall within the strictest terms of the clinical criteria for pathological gambling, and does not include many others who may still suffer problems from their gambling, yet fail to display the criteria for a pathological diagnosis.

While pathological or problem gambling represents a significant social concern, research on gambling as a whole has occurred within a relatively narrow scope. Research in the field of gambling as a whole has focused primarily on the assessment of pathological gambling and the maintaining variables of forms of gambling such as video lottery terminals, slot machines, horse racing, Video-Poker, and table games such as craps and roulette (Black & Moyer, 1998: Cox, Lesieur, Rosenthal, & Volberg, 1997: Dickerson & Adcock, 1987: Kallick, Suites, Dielman, & Hybels, 1976). Research into the controlling variables of gambling behavior has focused on various theories including cognitive mediated theories, biological or psychobiological theories, and operant theories (Dickerson & Adcock, 1987; Dixon & Schreiber, 2004; Friedenberg, Blanchard, Wulfer, & Malta, 2002; Griffiths, 1989; Ladouceur, Sevigny, Blaszczynski, O’Conner, & Lavoie, 2003, Sharpe, 2004).

While there is certainly massive need for basic experimental research on gambling, the experimental analysis of gambling behavior...
presents many challenges. First of all, from a behavioral perspective, there are a severely limited number of researchers who would identify themselves as primarily interested in the study of gambling. In addition, based on governmental regulation of gambling and basic ethical concerns in research, it is difficult to conduct studies on gambling behavior with a reasonable amount of internal or external validity (Weatherly & Phelps, 2006).

Legal provisions against owning and operating actual gaming machines that can be found in US casinos as well as their prohibitively high cost make the purchase and use of actual gaming machines such as slot machines and Video-Poker terminals for research generally infeasible. In addition, if one can procure such machines there are provisions regarding tampering with how they work, which can severely limit one’s ability to program specific outcomes that may be needed for the level of experimental control necessary to answer a given research question.

Some researchers have tried to work around these issues with varying degrees of success. For example, MacLin, Dixon, and Hayes (1999) and MacLin, Dixon, Robinson and Daugherty (2006) have written on how to create a computerized slot machine simulation for conducting behavioral research. Simulation software for both Video-Poker and roulette have been created and offered free of charge to anyone willing to conduct research into these games (Dixon, MacLin, & Hayes 1999; MacLin, & Dixon, 2004). To date most of the research that has employed these software solutions has been primarily focused on slot machines (Christopherson & Weatherly, 2006; Weatherly, McDougall, & Gillis, 2006; Weatherly, Sauter, & King, 2004), with only one published study presenting data either using the published roulette or Video-Poker software (Dixon & Schreiber, 2002).

Another potential solution is to make use of commercially available gambling simulation software. This paper will describe one such piece of software, WinPoker 6.0 (Zamzow Software Solutions, 2007), a commercially available Video-Poker simulation and trainer which can be purchased for approximately $30. The purpose of the current paper is to describe this software and to discuss how it may be employed to study gambling from a behavioral perspective. This paper will describe the multitude of potential independent and dependent variables that can be studied using WinPoker 6.0.

WinPoker 6.0

WinPoker 6.0 is a commercially available Video-Poker simulation and trainer that sells for approximately $30 (Zamzow Software Solutions, 2007). Video-Poker is an electronic game based on variations of standard 5 card draw poker using a standard 52 card deck. Like slot machines, Video-Poker is a single player game with a relatively simple interface that most anyone with any level of experience can play. Where Video-Poker differs from other single player games such as slot machines is that based on the specific Video-Poker game variation being played and the payout structure for that game, an actual strategy may be employed which can result in rates of return of greater than 100% over the long run. In addition, even the least favorable configurations of Video-Poker offer rates of return of greater than 90%, when played correctly. The above mentioned software is advertised as training software to help improve your return on your gambling investments in actual casinos. WinPoker 6.0 offers various training modes to help users learn to make the statistically correct decision based on the specific game and payout structure employed. From a research perspective, however, this software can be put to more academic uses. The nature of the structure of the software offers many potential avenues for research into gambling behavior.

Potential Independent Variables.
Formal Properties

Prior research in gambling has examined the effects of contextual stimuli and discussed the impact that formal properties of gambling machines may have on behavior (Hoon, Dymond, Jackson, & Dixon, in press; Parke and Griffiths, 2006; Zlomke & Dixon, 2006). WinPoker 6.0 offers the ability to manipulate various formal properties of the game structure including sound, deck color, card back style, and coin drop display. By clicking on the “Options” tab on the Main Menu, one can see many of these options.

Credits and Betting Amounts

The software also offers the user the ability to start with a predetermined number of credits between 1 and 1000. By clicking on the “Player” tab on the Main Menu and selecting from the available options one can choose to reset the current number of credits to zero or to buy a specific number of credits. What these credits are “worth” depend on what the coin drop display is set at or what instructions are given to whoever is playing the game. The coin drop display can be set at 6 levels including 5¢, 25¢, 50¢, $1, $5, and $25.

Like most casino versions of Video-Poker, players can choose the number of credits they wish to wager at the start of a hand up to a maximum limit. In the case of this software players can wager from 1 to 5 credits per hand in single line play. One potential manipulation that could be employed could consist of limiting the amount that a player may wager on a given hand. While the software does not offer specific settings to limit amount bet, this could be accomplished either through instructions or experimenter monitoring or a combination of the two.

Games and Payout Tables

WinPoker 6.0 features many manipulable features that in a research context can be put to use as potential independent variables for study. First and foremost amongst all of these features are the number of different specific and user defined Video-Poker variations built into the software. WinPoker 6.0 features 22 preset Video-Poker variations. These games feature many of the most popular variations of Video-Poker that may be found in real casinos, including Jacks or Better, Deuces Wild, Bonus Poker and many others. To choose from the many variation of Video-Poker offered one needs to simply click on the “Games” tab on the Main Menu and select from the game options. The left panel of Figure 1 displays the included games. In addition the software offers the ability to create up to 10 user defined games, by clicking on the “Games” tab and selecting the “Define” option.

WinPoker 6.0 also offers information on the Total Return for all of the included games when played perfectly as well as the Game Variance for each game. This information can be accessed by clicking on the “Analyze” tab from the main menu and selecting the “Game” option. In addition to this information for the preset games, the Total Return for a User defined or custom game can be calculated from this screen by clicking on the “Run Analysis” button.

In addition to defining whole games the software also features the ability to modify the payout tables on existing games. One can change existing pay tables by clicking on the “Options” tab on the main menu and selecting the “Change Pay Tables…” option. From the resulting screen, the pay rate for each hand for all available games can be modified as displayed in the right panel of Figure 1.
Figure 1. The left panel of Figure 1 displays the available Video-Poker Gamer variations in WinPoker 6.0. The right panel of Figure 1 displays the modification of a pay table in the WinPoker Pay Table screen.

**Multiple line play**

One variation of Video-Poker that can be found in most casinos allows players to play multiple hands at the same time. WinPoker 6.0 offers multiple Multi-Play options, allowing players to play 3, 4, 5, or 10 hands at a time, which can be accessed by clicking on the “Multi-Play” tab on the main menu. In this type of variation, a player chooses an amount to wager per hand (1-5) credits, and is then dealt a hand. The player chooses which cards they would like to keep, and then gets to see the results of a number of different draws depending on which Multi-Play game is chosen. For example in a 10-play version of Jacks or Better a player could choose to wager the max of 5 credits on a hand, which when multiplied by the number of hands in this variation would mean that he/she is wagering 50 credits total. The player would then be dealt a hand and would choose which cards to keep as displayed in Figure 2. The player would then get 10 separate draws based on the card kept and cards remaining in the deck, and would earn all of the credits won across all 10 draws. These Multi-Play variations might offer a potential to study variations in betting patterns and decisions in multiple line games.

**Training Modes**

First and foremost this software is marketed as Video-Poker training software. WinPoker 6.0 offers 5 different training modes to alert players of errors in play and to teach the correct play based on the given Video-Poker variation. These different modes can be toggled on and off by clicking on the “Training Modes” tab on the main menu or by clicking on the bottom gray button above the “Bet 1 Coin” button on the main game play screen, and are discussed below.
Figure 2. A 10 Play version of Jacks or Better

Figure 3. The warning pop up box and the Hand Details screen available under the Warn Training Mode.
Warn

One training mode is called the Warn mode. In this training format players are alerted every time they make an error by a pop up window in the middle of the screen as displayed in Figure 3. This pop up window informs the player of the severity of the error in play (minor, moderate, or major) and gives them specific information on how much the error is costing them in the long run. The window also informs the player of the expected value or return of the correct play as well as the expected return of the play the player is currently attempting to make. The pop up window gives the player the option of continuing with the chosen play or returning to the game to change cards currently held. This mode, does not easily display what the correct play is, unless one clicks on the “Details…” button on the pop up. The Hand Details screen as displayed in figure 3 shows the expected returns for each of the 32 possible hand combinations in descending order, with the best play displayed at the top. The Hand Details screen also displays the total number of possible hands that could result based on the cards held as well as the number of those possible hands that will result in no winning combinations, and the number of those possible hand combinations that will result in any of the winning combinations listed in the payout table.

Autohold

The Autohold training mode automatically chooses the correct cards to hold for the player. If the player chooses to change the cards held and play the hand differently, the same “Statistical Error” pop up warning as described for the Warn mode will be displayed.

Test

As with the Warn and Autohold modes, the Test training mode will inform a player of a playing error, however, it differs in that it does not allow the player to correct that error. As displayed in Figure 4, the software informs the player of what cards should be held and which ones should not, by the display of the text “Hold” or “Draw” beneath the card as well as the severity of the error (Major, Moderate, or Minor). In addition the Test mode offers access to the Hand Details screen described previously for the Warn mode. The player may only continue with the hand play as chosen however, and cannot correct the error.

Show

The Show training mode is very similar to the Test training mode. As with the Test training mode, the Show training mode displays the correct cards to hold and offers access to the details screen; however it does not inform the player of the severity of the error.

Advanced Training Mode

WinPoker 6.0 also offers an Advanced Training mode with allows the user to practice with various types of hands or “Deal Types”. This mode can be turned on by clicking on the “Training Modes” tab on the main menu and selecting the “Advanced” option. This mode differs from the other training modes in that it only allows players to choose which cards to hold and does not actually allow them to see real outcomes. From a behavioral standpoint, this mode offers the most potential to study patterns of play while controlling for the effects of reinforcement or under extinction conditions. While in the Advanced Training mode players do not see the result of the decisions made, this mode can be combined with the previously described training modes to provide players with additional feedback on errors being made.

The Advanced Training mode offers the ability to analyze play with multiple types of hands or “Deal Types”. This mode can be set
to display “Normal (Random)” hands. It can also be set to only display “Hard Hands”. What defines a “Hard Hand” is customizable, but by default is set to any hand where the differential of the Expected Value of the best play and the second best return Expected Value is less than 2 coins/credits. This training mode also features the ability to allow the player to set the specific hand dealt. Finally this mode features a setting to choose hands from an error log of the last 100 errors.

Figure 5 shows the display under the default settings of the Advanced Training Mode. This mode by default displays an Advanced Window which displays many of the settings and results from play in the Advanced Training Mode. From this window one can choose from the Deal Types described above, view a log of all errors that are currently saved to the error log, set the parameters of what qualifies as a “Hard Hand”, or clear the current statistics. From this window one can also see the number of hands played as well as the number of errors committed. This window also displays the expected return based on play thus far as well as the overall cost of the errors committed. The visibility of this window can be toggled on and off so that players may either see constant feedback on these results or can continue to play with no feedback. To toggle the visibility of this window one can click on the “Training Modes” tab on the main menu and select the “Hide Advanced Window” option.

**Error Thresholds**

Throughout the description of the various training components of WinPoker 6.0 described here, how the software can report on the severity of playing errors, by labeling
Figure 5. The feedback provided in the Advanced Training Mode with the Advanced Win-
dow displayed.

Figure 6. The Set Training Mode Thresholds window for setting the thresholds of Minor,
Moderate and Major Errors.
errors on a 3 level continuum including Major, Moderate, and Minor errors has been mentioned. Another customizable feature of this software that could serve as a potential independent variable consists of the thresholds for these error labels. Under the “Training Modes” tab of the main menu is an option for Error Settings. These error continuums are based on the cost in cents that each error represents per play, and can be individually set for each different coin value setting for the game as can be seen in Figure 6.

Options for Concurrent Responding
A final feature of WinPoker 6.0 makes it a very attractive option for studying gambling behavior under conditions where concurrent responding options are made available. With WinPoker 6.0 you can open multiple instances of the game on a single computer. In addition you can apply completely different settings to each open instance of the game on a given computer. For instance, as displayed in Figure 7, you could open 2 instances of WinPoker 6.0 where the settings differ along a single dimension (in the case of the Figure 7, the game in the left panel has the Autohold Training mode turned on displaying the correct play, while the game in the right panel has no training mode turned on). Such variations offer opportunities to measure the allocation of responses on two concurrently available games.

This ability to open multiple instances of the software to present multiple games in some sort of array on a single computer may offer certain considerations along the lines of external validity when noted that actual casinos often present banks or arrays of similar but different games from which casino patrons may choose to allocate their gambling dollars to.

Dependent Variables
Thus far we have discussed how many of the built in options and elements of WinPoker 6.0 may be potentially manipulated to serve as potential independent variables for study. However, more importantly we need to consider what type of behavioral measures we can get from this software that may serve as dependent variables of study.

Win Poker 6.0 offers many built in analysis features that are intended to give the
user feedback as they learn to improve their play on each type of Video-Poker game played. While these features may be intended for the improvement of an individual’s play, they can also serve the purposes of a creative researcher when it comes to measuring the behavior of a gambler. In the measurement of behavior of any kind, we are often interested in a number of features of behavior, namely, frequency, rate, duration, and in the study of gambling behavior this is no different.

When it comes to potential elements of behavior we may wish to study within the context of an individual playing Video-Poker, there are many options that are available to us. We may simply be interested in the frequency or number of hands an individual plays over a given period of time. We may want to translate this information into a calculation of their rate of play. We may have some interest in the amount that an individual bets under various conditions of play. We may wish to measure the number of coins played, amount bet per hand, etc. In discussing the training options available with WinPoker 6.0 errors have been described in some detail. We ultimately may wish to examine frequency or rate of errors for a given individual under various game conditions. We may also be interested in recording the specific errors that an individual makes for further analysis. In addition, any gambling activity is an activity of probabilistic reinforcement, and we may wish to record the actual outcomes of an individuals’ play in regards to rates of return, coins won, or Payback percentage. The built in feedback options in WinPoker 6.0 give us direct access to many of the potential dependent variables described above, and one may also be creative and employ additional measures or direct observation when the built in features lack the specificity necessary for a given research question.

**Hands Played**

Win Poker 6.0 has a couple of built in features for keeping track of the number of hands played. In the upper right of the main playing screen, WinPoker 6.0 features a running counter of hands played as can be seen in
Figure 8. This counter can easily be reset by clicking on the red button to its right. In addition to this counter, WinPoker 6.0 keeps a separate count of hands played in a detailed session history screen which may be accessed by either clicking on the “Session” button in the middle right of the main game play screen, or by clicking on the “Analyze” tab on the main menu and selecting the resulting “Current Session” option. The hand counter in the “Current Session Analysis” screen and the one featured on the main playing screen are independent of one another and one may be reset without affecting the other.

Current Session Analysis

Above it was discussed that the hand information available in the “Current Session Analysis” screen which may either be accessed via the “Session” button on the right of the main playing screen or through the “Analyze” tab on the Main Menu. This screen, as displayed in Figure 9, offers a wealth of information that can be used for data collection. Specifically this screen reports information on Hand Results, Playing Errors, Coin Results, and the Error Effect on Total Return.

Hand Results

The Hand Results section of the “Current Session Analysis” screen offers information regarding the number of hands played during the current session, the duration of the current session can be seen in the Session Time box, and the rate of play can be seen in the Hands per Hour box.

Coin Results

The Coin Results section of the “Current Session Analysis” screen offers information regarding the amount wagered and the results of those wagers overall. The number of credits wagered or coins played can be seen in the “Coins Played” box. This information could be combined with the number of hands played or the session time in order to calculate average wagers per hand or the rate of wagering. This section also gives information regarding the overall outcome of the hands played and credits wagered over the current session. The number of coins won can be seen in the “Coins Won” box and this is translated into an overall percentage return that is displayed in the “Payback %” box. Overall the number of coins either won or lost is seen in the “You Lost” box (if a profit had been earned for the given session this would be displayed as a “You Won” box).

Playing Errors

The accuracy of game play decisions can be seen in the “Playing Errors” section of the “Current Session Analysis” screen. The total number of playing errors can be seen in the “Total Errors” box with the number of errors of each level of severity seen in the “Minor”, “Moderate”, and “Major” error boxes. Based on the number of hands played these errors translate in an overall percentage of correct play that is displayed in the “% Correct” box.

Error Effect on Total Return

The effect of errors made on the overall rate of return of all of the wagers made in the current session is displayed in the “Error Effect on Total Return” section. The best return possible for the current session if no errors were made is displayed in the “Best Return” box, while the actual return for the current session based on the actual plays made is displayed in the “Your Return” box. These numbers translate in a percentage of possible return for the current session that is displayed in the “Return %” box. Subtracting the actual return from the best return results in an overall cost of the errors made in the current session in coins that is displayed in the “Cost in Coins” box.

Using the Current Session Analysis
Figure 9. The Current Session Analysis screen displays Hand Results, Coin Results, Playing Errors, and the Error Effect on Total return for the current session.

Figure 10. The WinPoker Play Analysis screen displays the overall results for each game.
The different pieces of information described above that are displayed in the Current Session Analysis are potentially the most important potential sources of data. Weatherly, Austin, and Farwell (2007), examined the effects of self reported poker “experience” on playing errors and amount wagered in three different Video-Poker games using the WinPoker 6.0 software described in this article. In this study the authors examined differences between experienced and inexperienced poker players on a number of dependent variables including number of hands played per session, error rates as measured by the % Correct statistic, credits wagered per session, and bet size per hand. All of these variables were recorded from the Current Session Analysis screen.

While Weatherly et al. (2007) employed a group design which required recording data from the Current Session Analysis one time per subject; this screen could also be employed to collect repeated measures in a single subject design study. For example, if one wished to conduct a study measuring the effects of some type of training program on percentage correct play, one could have a participant play for either a preset amount of time or number of hands. The Current Session Analysis screen could then be opened and data recorded. One could then reset all information to zero by clicking on the “Reset Numbers to Zero” button, close the screen, and let the participant continue playing. This pattern could be continued until stable responding is assessed and then the training program could be employed and repeated measures could be taken to observe the effects of the training program.

WinPoker Play Analysis

While the Current Session Analysis screen described above may offer the best method for recording more immediate or molecular levels of behavior, the “WinPoker Play Analysis” screen may offer a method for recording more molar data of overall play. The WinPoker Play Analysis screen as seen in Figure 10 can be accessed by clicking on the “Analyze” tab on the main menu and selecting the “Overall Play” option. This screen displays results for all available games. Each available game can be selected from the drop down box in the upper left of the screen as displayed in Figure 10. Each type of possible outcome in the chosen game as well as the number of times they have occurred over the “Total Hands Played” for the given game as well as the resulting percentage of outcomes are displayed on the left of the screen. In addition many of the pieces of information described previously for the Current Session Analysis screen such as the Coin Results, Playing Errors, and Error Effect on Total Return are displayed on the right side of the screen.

View Playing Errors

The final source of potential dependent variables that we would like to mention is displayed under the Advanced Training Window described previously. As described previously, you can turn on the Advanced Training mode by clicking on the “Training Modes” tab on the main menu and selecting the “Advanced” option. If the Advanced Training Window is toggled on, you can view a log of the last 100 errors for each game by clicking on the “View…” button to the right of the “From Error Log” button. This will open the “View Playing Errors” window as seen in Figure 11.

This window allows you to see detailed results for the currently chosen game including a detailed view of the last 100 playing errors that were made. This screen displays the cards that were dealt for each error across the top, with the cards that actually were held indicated by the text “Held” above the cards, and the cards that should have been held indicated by the text “Hold” beneath the cards. One can cycle through the last 100 errors by clicking on the left and right arrows on the
Figure 11. The View Playing Errors window under the Error Log in the Advanced Training Mode displays detailed information on the last 100 errors and total history for the currently chosen game.

left side of the “For the error displayed” area in the middle of the window. This area also displays the classification of the severity of the error, the best Expected Value for the hand dealt if the correct play was made, the actual Expected Value of the hand given the way it was played, as well as the cost in cents of the error that was made.

Beneath this area the window displays a summary for the history of the currently selected game beyond the last 100 errors including all errors that have ever been made and their classification, the overall number of hands that have been played in the current game, as well as the best expected return given perfect play, the actual return based on the errors made, as well as the calculated return percentage and overall cost of the errors that have been made.

Limitations of WinPoker 6.0

While all of the above mentioned potential dependent measures can serve many purposes, there are other possible variables of interest that WinPoker 6.0 does not keep track of that many potential researchers could have some interest in. While the software does not keep track of these measures, a creative researcher may still find ways to record additional variables of interest through direct observation or other means.

One specific limitation of WinPoker 6.0 is that it does not keep a direct record of each hand that an individual plays. While as mentioned previously it is possible to access records of the last 100 errors made on the
Table 1

Potential Research Questions That Can Be Addressed Using WinPoker 6.0

<table>
<thead>
<tr>
<th>Potential Research Questions</th>
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<tbody>
<tr>
<td>Which training format offers the best method of increasing percent correct responding to a specified criterion?</td>
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<td>Do “experienced” video-poker players make different types of errors than “inexperienced” players?</td>
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<td>Which game variations do players show the highest rates of errors on?</td>
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<td>Does experiencing the outcome of game play decision facilitate or decrease the length of training necessary to decrease error rate to a specified criterion?</td>
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<td>Does training on one game format affect play on other game formats?</td>
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<tr>
<td>What effect does error feedback have on number of hands played?</td>
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<td>What effect does error feedback have on total coins bet?</td>
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<td>What effect does error feedback have on average credits bet per hand?</td>
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<tr>
<td>What effect does the amount of money credits are worth have on total amount bet, hands played, error rate, or amount bet per hand?</td>
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<tr>
<td>Does training differentially affect the rates of different types of errors?</td>
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<tr>
<td>What effect do adjustments to the payout table on a given game have on “experienced” players?</td>
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game, however, if a researcher wished to examine every hand that a participant had played over the course of a session including the specific cards dealt, cards help, and amount bet, methods to do so would have to come from outside of the existing software. One possible solution may be to employ any of a number of software options for taking screen capture video (i.e. Camtasia Studio (Techsmith Corporation); CaptureWizPro (PixelMetrics), ACA Screen Recorder (ACA Systems)). Direct recordings of variables of interest could then be made from these videos at the leisure of the researcher.

Another potential variable of interest which WinPoker 6.0 has not method to record is latency between responses. The latency between gambles in both Video-Poker and other games of chance such as slot machines have been examined by researchers and have been found to differ based on the outcome of the gamble (Dixon & Schreiber, 2002: Dixon & Schreiber, 2004). In addition, using the software developed by Dixon, MacLin and Hayes (1999), Dixon and Schreiber (2002) recorded the mean decision time between deals and draws in Video-Poker. While WinPoker 6.0 does not record these variables, it is not hard to envision how one could employ direct observation either with an actual observer, through the use of screen capture video recording as described previously, or through a camcorder set up to record the actual screen display to create a direct record of behavior from which latency can be measured.

While the two above mentioned areas of limitation described above for WinPoker 6.0 do not exhaust all of the potential shortcomings of this software, they do represent two areas in which WinPoker 6.0 falls short of
previously described video-poker software solutions when it comes to dependent measures (i.e. Dixon, MacLin, & Hayes, 1999). Additional areas of concern or limitations that might arise are going to depend on the specific research question being asked. However a wealth of research questions could be addressed using WinPoker 6.0 and make it a very attractive and available tool for the study of gambling behavior. In addition the wealth of manipulable features available with this piece of software dwarf those offered in previously described pieces of software (i.e. Dixon et al, 1999), and make the limitations mentioned seem less significant. Table 1 displays a list of potential research questions that could be addressed using WinPoker 6.0. This list in no way exhausts all of the possible questions this software could be employed to address, but should serve as an indicator of the potential contribution of WinPoker 6.0 to a research program interested in studying gambling.

Overall WinPoker 6.0 offers a readily available and relatively inexpensive (approximately $30) option for studying gambling behavior. The fact that it is specifically designed to simulate and train individuals to play many of the more popular versions of Video-Poker found in actual casinos, make it a very attractive option for studying Video-Poker gambling. As described in the current paper many of the built in features intended to help individuals better their Video-Poker strategy lend themselves well towards both dependent and independent variables of interest in the study of gambling behavior.

REFERENCES


*Action Editor: Mark R. Dixon*
IN MEMORIAM

W. SCOTT WOOD

1940-2006

Patrick M. Ghezzi
University of Nevada, Reno

This inaugural issue of the Analysis of Gambling Behavior begins on a sad note: Our friend and colleague Scott Wood passed away on November 23, 2006.

An Arizona State PhD under Jack Michael’s direction and a longtime faculty member at Drake University, Scott is perhaps best known for his role in transforming the Mid-Western Association for Behavior Analysis (MABA) into the Association for Behavior Analysis (ABA) (see Peterson, 1978). Equally noteworthy is Scott’s involvement in creating and then serving as the first editor of The Behavior Analyst (see Wood, 1978). Scott also had a hand in establishing the B. F. Skinner Foundation. Scott worked tirelessly on these and many other pursuits, and it is a safe bet that without his leadership and wisdom, the field of behavior analysis would have a very different look than it has today.

Scott’s interest in gaming and gambling behavior took a formal turn in the mid-1990s with an appointment to the Iowa Gambling Treatment Program Advisory Committee. It was at about this same time that a small group of behavior analysts began presenting papers on gambling at ABA. Scott’s participation at these early sessions was both inspirational and visionary. Indeed, it was Scott who insisted upon forming a special interest group on gambling at ABA, and in 2001 the BIG-SIG (Behaviorists Interested in Gambling Special Interest Group) was formed.

Scott’s contribution to the analysis of gambling evolved from his longstanding study of verbal behavior. He was convinced that gambling was fundamentally a rule-governed affair, and that gamblers frequently applied fallacious rules about games of chance that affected their rate and pattern of
play. His Drake Beliefs about Chance (DBC) inventory (Wood & Clapham, 2006) was developed to assess this important aspect of gambling.

Scott’s colleagues on the Iowa Gambling Treatment Program Advisory Committee passed a resolution memorializing his passing at its January 5, 2007 meeting (www.idph.state.ia.us). The resolution read, in part, as follows:

For many years, Dr. Wood has brought his unique professional insight and scholarly perspective to the Committee and the Program and has given unselfishly of his time and talents in support of academic and programmatic efforts toward achieving better understanding, research, education and treatment of problem gambling behavior.

We might add that in addition to his “unique professional insight and scholarly perspective,” Scott also brought his inimitable charm, wit, and style to everyone he met and to all of us who were lucky to call him a friend. It is with a profound sense of sadness and loss, then, that we dedicate this first issue of the Analysis of Gambling Behavior to his memory.

REFERENCES


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