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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 “experiment,” 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.

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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, one must 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 exposure 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 psycholog-

ical 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 conjointly, 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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