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Over the past decade behavior analysts have paid increasing attention to the clinical phenomena of pathological gambling. Explorations have varied from animal models to therapeutic interventions. Perhaps no topic has received greater attention in the behavioral gambling literature than the discounting of delayed consequences. Delay discounting has been noted as both a conceptual framework to understand problem gambling as well as a dependent variable by which to deduce level of pathology. Regardless of hypothesized process, discounting appears to be a topic of great interest to those within the behavioral community. This special section of the *Analysis of Gambling Behavior* brings together a theoretical account of problem gambling from Fantino and Stolarz-Fantino as well as fourteen commentaries from an impressive list of authors within and beyond the traditional bounds of behavior analysis. Together these articles highlight the wide range of perspectives on the causes of pathological gambling, as well as how delay discounting fits within such causal mechanisms.

Keywords: Pathological gambling, discounting, addiction, choice making

OVERVIEW OF DELAY DISCOUNTING

When given the opportunity to select between two alternatives of equal value yet delivered at different intervals in time, the choices made by most of us appear rational. Everything else being equal, we would rather have the same outcome delivered sooner rather than later. Take for example 1000 dollars. If offered either today or next week, it is safe to assume that most of us would rather have it now than later. If the week was delayed even further in time, to say, 1 year, odds are still good that most of us would continue to prefer the immediate alternative. However, when both the amount of the alternative varies as well as the delay to delivery, our behavior tends to not be so predictable. If we are faced with 500 dollars now or 1000 in a week, all bets are off. Perhaps we need to get our car fixed, pay rent, or buy groceries today. Even though we know that 1000 dollars are more than 500 dollars, time and the activities found within may dictate which outcome is critical for us to choose.

For the past 20 years, many researchers have explored the choices we make under similar conditions to those described above. Varying amounts of money are posed against each other, often at varying delays. Interestingly, what appears to remain clear across the myriad of studies that have been published on delay discounting is that as time to gain access to an outcome/reward increases, we appear to prefer smaller sooner rewards. While disadvantageous to select smaller immediate rewards, increased delays produce increased "discounting." Populations that have been investigated range from children with brain injuries (Dixon et al., 2005), smokers (Reynolds, Richards, Horn, & Karraker, 2003), drug users (Heal, Johnson, Higgins, & Bickel, 2005), over-eaters (Weller, Cook, Avsar, & Cox, 2008), and pathological gamblers (Dixon, Marley, & Jacobs, 2003).

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Interestingly, most clinical populations appear to "discount" at greater rates than matched control (i.e. non-clinical) populations.

DISCOUNTING AS A CONTRIBUTING FACTOR FOR GAMBLING

It has been noted by some in behavior analysis that individuals who discount delayed rewards, may in fact be more prone to gambling (Weatherly, Derenne, & Chase, 2008; Weatherly & Dixon, 2007; Madden, this issue). Here a relationship is assumed to some degree that if an individual possesses a behavioral repertoire of making choices for smaller immediate reinforcers, then in fact, they may display such impulsive choice making when it comes to gambling. They may gamble longer, may risk more money, or both. Preliminary data attempting to correlate discounting with various risk-factors for pathological gambling have failed to find a relationship (e.g. Weatherly, Derenne, & Chase, 2008). However, direct comparisons of gambling activity between high and low discounting persons have yet to be conducted.

Conceptualizing delay discounting as a participating factor that modulates problem gambling suggests at least a degree of belief that discounting is a static trait of an individual, rather than a transient state. Researchers study various clinical "groups" and compare them to non-clinical comparisons. Such an approach, and assumption of the stable nature of discounting, should be questioned. Recent evidence suggests that discounting of pathological gamblers can be increased or decreased via psychological conditioning (Dixon & Holton, in press) as well as be sensitive to changes in context alone (Dixon, Jacobs, & Sanders, 2006). In short, the debate on the stability of a pattern or degree of discounting within an individual remains open to further exploration.

DISCOUNTING AS A DEPENDENT MEASURE OF GAMBLING SEVERITY

In contrast to the position that a person's history of discounting may in fact be a cause for their problems with gambling, it is also possible that one's severity of problems with gambling could be measured by their degree of delay discounting. While the difference in perspectives may initially seem trivial, it should not be. Widespread gambling severity and screening assessments are plagued with problems ranging from minimal or no psychometric properties to high levels of social desirability. If asking someone that is not interested in seeking treatment "Have you ever worried that you spend too much money on gambling?" a negative response is sure to emerge. However, ask that same question to someone seeking treatment, and a response "Yes" is quite predictable. When the two people are clearly spending a large proportion of their time and money on gambling, and such activity is yielding no positive financial return, objectively the two people are equal. Yet, they answer differently to a question designed to screen them for pathological gambling. Maybe some of our popular screening tools are more accurately depicting remorse about gambling than actual behavior. Perhaps it would be better to evaluate severity in more discrete ways that do not assume evaluations of the behavior but in fact simply measure the behavior itself. Choice making among financial alternatives, and the rates of discounting that emerge, may be a possible alternative strategy to evaluate gambling severity. To date, initial explorations appear positive (Alessi & Petry, 2003), and more research is clearly warranted.

WHERE DO WE GO FROM HERE?

The paper by Fantino and Stolarz-Fantino presents a behavioral conceptualization of the causes of pathological gambling and how the basic processes of gamblers, and the decisions

that they make, can be approached from a functional perspective. The authors review a number of foundational laboratory research investigations that have shaped their view on pathological gambling. They conclude with a position that delay discounting plays an important role in understanding why someone might be prone to gambling more than they should. However, discounting alone is not where they believe we find the answer. Instead a dynamic interaction of direct contingencies, verbal behavior, and social influences participate in the eventual act of gambling according to the authors. It is only in such complexity that the true answer to the mystery of gambling addiction shall emerge.

The fourteen commentaries that follow Fantino and Stolarz-Fantino's paper are as rich in content as they are diverse. Ranging from enthusiastic support to considerable doubt, these authors present fascinating interpretations of the most critical features for investigating pathological gambling. It is the intention that this special section of the *Analysis of Gambling Behavior* will serve as a stimulus for future research, hypothesis testing, and collaborative investigations at all levels of inquiry related to pathological gambling. From animal models and neuroscience to basic operant experimentation and clinical intervention, much work needs to be done. Thus, I present to you the special section on *Delay Discounting* in this issue of the *Analysis of Gambling Behavior*.

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