COMMENTARY

GAMBLING, PROBLEM-SOLVING, AND THE CONTINGENCIES OF SUPERSTITION: A RESPONSE TO FANTINO & STOLARZ-FANTINO

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The excellent paper by Fantino and Stolarz-Fantino provides a compelling examination of the behavioral complexities and paradoxes saturating gambling, risk-taking, and superstition. The paper concludes with two Zen-like (ironic but poignant) level headings: “Why We Should Not Expect Problem Gambling” followed by “Why We Should Expect Problem Gambling.” The issues presented in both of these level headings are addressed and presented to the reader with the realization that the topics remain increasingly intricate and experimentally allusive. The authors state:

> A more satisfying and complete account awaits after a great deal more research is undertaken. Discounting functions certainly play a central role in helping us appreciate the nature of gambling, but they are only a part of a rather rich tapestry of contingencies, including the social, emotional, and verbal.

We agree unquestionably, that rigorous investigations into the dynamics of gambling must continue. However, within the experimental analysis of human behavior, some of the answers may be found by looking forward and backward in time. We will briefly describe two rather dated studies conducted in the examination of gambling and superstitious behavior with a focus on how these might reflect some of the current issues within the analysis of these interwoven behavioral phenomena.

A fifteen year old study conducted by Ono (1994) provides a fascinating exploration of superstitious behavior among adult humans as experimental contingencies become increasingly transparent across conditions. In fact, this study may be a better simulation of gambling scenarios than superstitious behaviors. College students assigned to experimental or control groups were asked to generate rules regarding the best way to earn points when pulling a lever in an isolated experimental setting. In this study, students were provided points according to a differential reinforcement of high rate responding (DRH) schedule. If a participant performed at least 5 responses in 15 seconds, a reinforcement lamp was illuminated indicating point acquisition. Actual participants were given partners with whom they supposedly exchanged “response tips” while taking turns at the experimental apparatus. After completing each session, participants formulated and wrote bulletin board tips (rules) regarding how to best perform on the apparatus. Ostensibly, their “partners” did the same. The experimental arrangements were cleverly designed so that *it would appear that* participants would "benefit" from their own experience, as well as the experience of their respective “partners.”

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Initially, the confederates' bulletin board postings tended to exaggerate the optimal response rate needed to acquire maximum points during a given session. During the early stages of the experiment, participants showed a very high level of compliance with these rules. In fact, many participants pulled the lever four to five times faster than necessary. Interestingly, however, as the various experimental conditions unfolded, many of the participants' performances began to draft from the posted bulletin board tips. With increasing exposure to the actual contingencies, the participants appeared to be operating according to a combination of their own self-generated and posted rules (accurate or otherwise) and "some" of the rules provided by the confederates. Unlike a control group unexposed to confederate tips, however, the experimental participants usually failed to maximize their response potential in accordance with the prevailing contingencies within a given condition. Notwithstanding, it is fascinating to note that while the participants gradually drifted away from absolute compliance with posted confederate (counterfeit) tips for maximizing rewards, these participants always performed in absolute compliance with the (accurate or inaccurate) response tips they, themselves, had generated and posted on the bulletin board for the benefit of their respective partners.

Five years later, we (Ninness & Ninness, 1999) published a "math oriented" systematic replication of the now classic Ono study by way of a coin toss graphic computer math game. In this somewhat dated study, fifth-grade students engaged in a form of "mathematical gambling." Group 1 students were exposed to response-independent reinforcement according to a second-order RR 2 (RT 30-s:S) (fluctuating between 15-s and 45-s) by way of our (primitive by today's standards) coin toss computer-interactive simulation. As a historical marker, sometimes such higher-order schedules have been referred to as "double-intermittent" schedules (Millenson & Leslie, 1979). Students in Group 2 received standard RT 30-s reinforcement while a control group was simply exposed to the same demand conditions, but received no form of programmed consequences while sitting at the computer. For this control group, accurate responding to math problems simply allowed access to more math problems.

During the final stage of the study, an extinction condition, students receiving RR 2 (RT 30-s:S) continued performing at extremely high rates throughout the duration of a 25-min extinction condition in which the simulated coins continued to flip intermittently but never matched following each correct math response. Unlike control participants or participants in Group 2, debriefing comments made by Group 1 students exposed to this "double-intermittent schedule" suggested that they really wanted to work even longer and would have done so had the program not terminated automatically after 25-min. Paradoxically, these participants earned less than half as much financial reinforcement as Group 2 students, while they performed an average of 287 more responses across experimental conditions. It is particularly remarkable to note that these students performed at their highest level of speed and accuracy during the extended but fruitless extinction session.

We believe that the relentless persistence and robust rates of accurate problem solving in the face of extinction displayed by Group 1 subjects may be at least partially attributable to the rule-governed effects emerging from exposure to the second-order schedules. Interestingly, parallel findings have been demonstrated in nonverbal organisms. As another related classic study, Zimmerman (1957, 1959), shaped a FR 15 lever press to the sound of a buzzer as a S^D allowing access to an opportunity to an alleyway and ultimately receive primary reinforcers. By integrating the FR 15 lever press as a second-order operant, rats executed literally thousands of lever presses and sustained extraordinarily high rates of responding for over 20 hr in the face of experimental extinction. *Analogously*, astonishingly high rates and long durations of extremely accurate problem solving by Group 1 students may have been attributable to the direct-acting *and* the self-generated rule-governed effects emerging from contact with our doubly-intermittent coin-toss form of mathematical gambling.

The previous sentence may beg the question, why invoke the influence of self-generated rules when lower organisms appear to respond in similar fashion in the face of similar experimental arrangements? Unlike control participants as well as Group 2 participants exposed to (single-intermittent) RR reinforcement schedules, post experimental written responses from Group 1 students consistently indicated that they really "believed" there was a very real "cause and effect" relationship between their high rates of accurate responding and their likelihood of accessing increasing levels of monetary reinforcement via the coin toss gambling graphic. We are simply unable to rule-out the influence of self-generated rules, since all participants in Group 1 acted precisely in accordance with the very rules they had generated during extinction.

In total, it appears college students and fifth-graders behaved in accordance with the contingencies described by Fantino and Stolarz-Fantino “when the true contingencies are disguised, as they are in some gambling situations, players may be led to make less-than optimal decisions”. In the above Ono (1994) study, the underlying experimental contingencies became increasingly conspicuous and the participants’ self-stated rules gradually reflected these contingencies, as did their behavior. With regard to our fifth graders, accurate rules were rarely expressed, and very much like the author’s description of the research conducted by Ladouceur and Sévigny (2005), subjects:

> “persisted longer in playing a video lottery game when they believed that pressing the screen activated a “stopping device” that made the reels stop spinning. This gave players the illusion of control over outcomes; in reality, the outcomes were pre-programmed and the device had no effect.”

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