Escalation Research: Providing New Frontiers for Applying Behavior Analysis to Organizational Behavior

Sonia M. Goltz
Michigan Technological University

Decision fiascoes such as escalation of commitment, the tendency of decision makers to “throw good money after bad,” can have serious consequences for organizations and are therefore of great interest in applied research. This paper discusses the use of behavior analysis in organizational behavior research on escalation. Among the most significant aspects of behavior-analytic research on escalation is that it has indicated that both the patterns of outcomes that decision makers have experienced for past decisions and the patterns of responses that they make are critical for understanding escalation. This research has also stimulated the refinement of methods by researchers to better assess decision making and the role reinforcement plays in it. Finally, behavior-analytic escalation research has not only indicated the utility of reinforcement principles for predicting more complex human behavior but has also suggested some additional areas for future exploration of decision making using behavior analysis.

Key words: applied behavior analysis, organizational behavior, decision making, escalation, persistence, reinforcement, variability

Shortly after the world of business was proclaimed “practically virgin territory” for the field of applied behavior analysis (Goodall, 1972), researchers began to include performance consequences in models of work motivation and leadership and in interventions designed to improve work (for reviews, see Komaki, 1986; Weiss, 1990). As noted by Komaki, the benefits of these applications of behavior analysis included the facilitation of more rigorous program evaluation in organizations and the expansion of the operant concept of performance consequences to include informational and neutral consequences. In her review, however, Komaki cautioned researchers to “refrain from conducting more studies demonstrating that feedback works in yet another setting with yet another behavior with yet another subject population” (p. 328). More recently, researchers

have occasionally illustrated how other organizational behavior topics could be viewed from an operant perspective. In most instances, though, little or no empirical work has followed the conceptual analyses for these additional areas. For example, behavior analyses of organizational culture (e.g., Eubanks & Lloyd, 1992; Mawhinney, 1992) and discussions of how statistical process control concepts from the management literature could contribute to organizational behavior management (e.g., Hantula, 1995; Mawhinney, 1986) have yet to generate substantive empirical results. Instead, the bulk of empirical research has continued to show how feedback works in yet another context (O’Flaherty & Komaki, 1992).

There is one area of recent empirical research using an operant perspective that has extended the application of operant concepts to behavior in organizations, however. Researchers have drawn on operant principles to explain and predict the tendency of decision makers to “throw good money after bad” (Goltz, 1992, 1993, 1999; Hantula & Crowell, 1994a, 1994b). This behavior is called *persistence* or *escalation of commitment* and has been de-

A previous version of this paper was presented at the 1997 conference of the Association for Behavior Analysis in Chicago.

Please address correspondence about this article to Sonia Goltz, School of Business and Economics, Michigan Technological University, 1400 Townsend Avenue, Houghton, Michigan 49931 (E-mail: smgoltz@mtu.edu).

defined as a "tendency for decision makers to persist with failing courses of action" (Brockner, 1992, p. 39; see Hantula, DeNicolis, & Goltz, 1995, for a further definition of terms). Escalation research represents a new frontier for the application of behavior analysis, offering both recent contributions to the organizational literature and potential areas for exploration. The purpose of this paper is to examine these existing and potential contributions. Brief summaries of the escalation literature and of behavior-analytic forays into the study of decision making will be presented first to provide a context for this discussion.

ESCALATION OF COMMITMENT

As documented in the organizational behavior literature, situations in which escalation is likely to occur are characterized by (a) an initial investment of resources in a course of action by the decision maker that results in losses or costs; (b) some degree of continuity over time of the decision dilemma; and (c) unknown consequences for withdrawal from the situation and for persistence in the course of action (Staw & Ross, 1987). Escalation involves a tendency for decision makers in these situations to increase investments of time, money, and other resources in organizational strategies that have been resulting in costs or losses, such as product development, plant expansion, or capital investment. For example, a number of escalation studies have examined role playing an administrator of a hypothetical company who previously made allocations to a research and development project to try to increase the market share of the company. These studies have found that, in these situations, subjects who were told that a project had not been successful allocated more additional funds to the project on a subsequent allocation than did subjects who were told that initial allocations had resulted in successful outcomes (e.g., Staw, 1976; Staw &

Fox, 1977; Staw & Ross, 1978). Besides investments in new product development, other scenarios that have been used in investigations of escalation include investments in the stock market (e.g., Goltz, 1992; Whyte, Saks, & Hook, 1997), decisions of whether to make high-risk loans (Whyte et al.), and the earmarking of government money for employment programs (Davis & Bobko, 1986). Research indicates that escalation effects generalize across these different tasks (e.g., Whyte et al.).

Since the initial escalation investigations, a substantial amount of research into escalation has accumulated with a variety of explanations proposed (for reviews, see Brockner, 1992; Staw, 1997). As with the original escalation studies, much of what is known today about escalation is based on analogue studies; however, escalation effects have also been demonstrated for actual tasks and settings that provide real consequences for participants. These include personnel decisions in a public-sector organization and in the National Basketball Association (Schoorman, 1988; Staw & Hoang, 1995) and with loan decisions of bank executives (Staw, Barsade, & Koput, 1995). In addition, research has demonstrated that escalation effects occur in different populations and that neither education level nor supervisory and business experience significantly affects subjects' responses (e.g., Armstrong, Coviello, & Safranek, 1993; Garland, Sandefur, & Rogers, 1990; Goltz, 1999; Harrison & Harrell, 1993). Further, escalation has been found for both individual and group decisions (Bazerman, Giuliano, & Appelman, 1984; Seibert & Goltz, *in press*). Thus, escalation research indicates that effects are likely to generalize beyond decisions made individually by undergraduates in the laboratory in role-playing situations to decision making by other populations in contexts with real consequences.

The question may arise as to why researchers have spent so much effort studying what seems to be a very spe-

cific behavior. There are several reasons that have been noted in the literature. First, the examination of escalation research fills a void in organizational research. Ross and Staw (1993) pointed out that much of organizational research has been devoted to understanding how action is initiated, such as through the examination of motivation or strategic decision making. Much less attention has been given to understanding the continuance or ending of organizational programs. A second reason given for examining escalation is that decision making is a very salient activity in organizations, particularly for managers (Hantula, 1992). This is reflected by the number of books devoted to the topic of decision making and problem solving in organizations (e.g., Fox, 1987; Guzzo & Salas, 1995; Shapira, 1997). A third reason escalation has garnered interest is because the behavior seems to be ubiquitous (Hantula). Governmental examples of escalation that have been cited in the literature include the Vietnam War (Staw, 1997) and the U.S. involvement in Nicaragua (Goltz, 1992). Business products of escalation that have been cited in the literature include RJR Nabisco's "smokeless" cigarette (Goltz), the Long Island Lighting Company's multibillion dollar nuclear plant later sold for \$1.00 (Ross & Staw, 1993), and the London Stock Exchange's information technology venture that eventually collapsed (Drummond, 1996). Fourth, researchers are particularly interested in the behavior because it appears to run counter to rules of economic rationality. In fact, the behavior suggests that decision theories that have been proposed may be inadequate, even though much research and teaching in business schools are dedicated to normative decision rules and models (Hantula). The final, and perhaps most important reason for studying the phenomenon is that decision fiascoes have very real and potentially serious costs to organizations (Hantula). In an analogue study by Goltz (1999), for example, subjects in

a condition designed to induce escalation invested an average of \$2.12 million more per quarter than did subjects in a condition that did not produce escalation. Over the 24 quarters of the experiment (simulating 6 years), the difference in allocations between these conditions added up to \$51 million. As Goltz noted, this finding is consistent with Mawhinney's (1995) suggestion that "little momentary" effects often produce large cumulative consequences in organizations.

THE DEVELOPMENT OF THE BEHAVIOR-ANALYTIC ESCALATION LITERATURE

The first behavioral analysis of escalation was offered by Platt (1973), who analyzed a specific type of escalation situation: social traps—in particular, the tragedy-of-the-commons dilemma (Hardin, 1968). In this dilemma, people in a New England village shared a common pasture for their cattle to graze freely. Because each cattle owner realized that he or she could make money faster by increasing the number of his or her cattle grazing on the commons, the pasture was eventually overgrazed, leaving no grass for anyone's cattle. Platt suggested that immediate individual positive consequences (more cattle to sell) and delayed negative group consequences (starved cattle) operated to sustain the overgrazing behavior. Note that Platt's analysis was purely conceptual, with no empirical support provided. A few years later, Staw and Ross (1978) briefly discussed a different operant-based explanation—the possibility that intermittent reinforcement underlies some escalation effects. A decade passed with no one developing or systematically validating reinforcement explanations of escalation, however. In fact, in their review of the literature, Staw and Ross (1987) noted a lack of research into the possibility that reinforcement is a psychological determinant of escalation.

In the meantime, other explanations

for escalation were developed and studied, and received the bulk of attention in the escalation literature. Many of these explanations were derived from concepts in the social psychological literature and examined primarily social and psychological determinants of escalation. For example, the *reactance* explanation suggests that individuals respond to failure as if it is a restriction on their freedom (Staw & Ross, 1978). The *framing* explanation, based on Kahneman and Tversky's prospect theory (1984), suggests that the decision situation triggers risk-seeking rather than risk-averse behavior (Arkes & Blumer, 1985; Northcraft & Neale, 1986). The *self-justification* explanation is based on Festinger's (1957) concept of cognitive dissonance. This explanation asserts that people who are responsible for initial decisions that result in failure will continue investing in an attempt to achieve success and demonstrate that their previous decisions were not poor ones (Staw, 1976; Staw & Fox, 1977; Staw & Ross, 1978; Teger, 1980).

At the same time that social psychological explanations were being investigated in the escalation literature, some behavior-analytic researchers were drawing upon the abundant research on choice with animals to make predictions about choice with humans (for a review, see Fantino, 1998). For example, Fantino and his colleagues found that, in most cases, no news was preferred over bad, suggesting that subjects respond more to the reinforcement property of news than to the information value of news (e.g., Case, Ploog, & Fantino, 1990; Fantino & Case, 1983). Rachlin and his colleagues demonstrated empirically that gambling probabilities can function as delays of reinforcement for human subjects (Rachlin, Logue, Gibbon, & Frankel, 1986). These studies, as well as other behavior-analytic work, indicated that cognitive accounts of decision making correspond to behavioral models of choice and that in many cases, behavioral models are both more

efficient and more general (e.g., Herrnstein, 1990; Rachlin, 1989, 1990; Rachlin et al., 1986).

Soon after these initial behavior analyses of human decision making, research was conducted to empirically confirm the viability of a reinforcement explanation of escalation. Research findings were consistent with earlier suggestions that behavioral models can account for human decision making. Unlike much of previous operant-based human decision making work, however, this research, as well as related research, has appeared in organizational decision-making journals such as *Decision Sciences* and *Organizational Behavior and Human Performance* (e.g., Bragger, Bragger, Hantula, & Kirnan, 1998; Goltz, 1993). In this research, a number of concepts found in experimental psychology and behavior analysis have been used to predict human decision-making responses under failure conditions (e.g., Goltz, 1992, 1993, 1999; Hantula & Crowell, 1994a). In particular, this research suggests that escalation is a manifestation of the partial reinforcement extinction (PRE) effect (Amsel, 1967)—the tendency for responses acquired under conditions of partial reinforcement to be more resistant to extinction than responses acquired under conditions of fixed or continuous reinforcement. For example, Goltz (1992, Experiment 1) asked subjects to imagine that they were entrusted with \$10,000 to manage for each of 32 decision periods. Subjects could allocate any portion of the money to a stock alternative that resulted in returns and losses and reserve the rest for a money market fund that did not earn or lose money. During acquisition, some subjects received a fixed partial schedule of returns consisting of returns for investing occurring on every other trial. Some subjects received a variable partial schedule of returns, in which returns occurred unpredictably, but occurred an average of one out of two trials. Some received continuous returns for investing in the stock alternative. As predicted, sub-

jects who experienced variable partial reinforcement persisted significantly longer than subjects in the other conditions during a later period when returns were no longer forthcoming (extinction).

Furthermore, there are a number of indicators of the robustness of this effect. First, these results have been consistently replicated (e.g., Goltz, 1992, 1993; Hantula & Crowell, 1994b). Second, operant-based studies of escalation that have reported effect sizes have found from medium to large effects for the reinforcement factors studied (e.g., Goltz, 1999). Third, studies that have reported individual as well as aggregate data suggest that effects found generalize across most individuals (e.g., Hantula & Crowell, 1994a). These findings indicate that reinforcement effects on escalation are consistent and strong enough to warrant continued examination.

The study of escalation using behavior analysis is advancing the literature in three ways. First, the use of behavior analysis has created a more dynamic and contextual view of escalation in the organizational literature due to its focus on reinforcement histories, response alternatives, and the measurement of behavior across time. Second, results of these investigations have led to methods designed to better assess reinforcement effects on escalation. Finally, behavior-analytic escalation research has yielded interesting effects that suggest additional research questions for behavior analysis and possible areas for extending reinforcement models of behavior. Further discussions of each of these areas follow.

PROVIDING METHODS TO BETTER ASSESS THE ROLE OF REINFORCEMENT HISTORIES AND THE DYNAMICS OF RESPONSES

One contribution of behavior-analytic investigations of escalation to the literature stems from the use of an acquisition phase of several trials during

which the pattern of outcomes an individual experiences is manipulated. In addition, behavior is measured over an extinction phase of several trials. This has allowed researchers to examine both the influence of reinforcement histories and the dynamics of escalation over time (Hantula, 1992; O'Flaherty & Komaki, 1992). Using this method, researchers have confirmed that both the patterns of outcomes decision makers have experienced for past decisions (hereafter referred to as *reinforcement history* or *outcome history*) and the patterns of responses they make are critical for understanding escalation. As O'Flaherty and Komaki phrased it, although subjects' escalation behavior "might initially appear to be in error to someone who takes a short-sighted view" (p. 592), they are actually behaving rationally in the larger context of an entire sequence of outcomes.

Reinforcement Histories

In most non-behavior-analytic escalation studies (e.g., Bazerman et al., 1984; Staw, 1976; Whyte, 1991), decision makers appear to have had either no outcome histories for investing in a course of action or an outcome history consisting of only a single event. For example, in some non-behavior-analytic studies of escalation, subjects were asked to *imagine* that they had initiated a project or previously made an allocation to a project (e.g., Harrison & Harrell, 1993). In other studies, subjects were allowed to choose which project or division to allocate a dollar amount that had been fixed by the experimenter (e.g., Staw, 1976). Next, they were given a single outcome: either success or failure. Then they were asked to determine the amount of a *single* allocation of additional resources. Between-groups comparisons were then made using this single allocation.

Behavior-analytic investigations of escalation, on the other hand, are very much focused on the effects of reinforcement histories on escalation. The empirical examination of the influence

of reinforcement histories began with Goltz (1992), who suggested that most individuals have experienced a history of partial reinforcement for investments and that they escalate because they have learned from this history that nonreinforcement is a discriminative stimulus for forthcoming positive outcomes. She suggested that because most escalation studies (e.g., Bazerman et al., 1984; Staw, 1976; Whyte, 1991) provide no experience with the task, subjects generalize from a previous history of variable partial reinforcement. Statements in the popular business literature such as "only one in ten such drugs ever receives final FDA approval" (Wechsler, 1989, p. 116) suggest that a history of partial reinforcement might be common for many tasks involving an investment of resources. As is known from the PRE effect, this type of history results in persistent responding during a period of nonreinforcement. Empirical support for this explanation was demonstrated in a number of studies in which researchers have compared responses of subjects presented with differing reinforcement histories (e.g., Goltz, 1992, 1993; Hantula & Crowell, 1994b). For example, Goltz (1992, Experiment 2) found that subjects who received no training on the task before experiencing continuous failure on the task responded similarly to subjects who had been previously variably reinforced. They, like subjects who received variable partial reinforcement, were more likely to persist during a series of failure experiences than were subjects who previously received continuous or fixed partial reinforcement.

Later behavior-analytic escalation studies that manipulated outcomes over an acquisition period in a fashion similar to Goltz (1992) yielded additional findings concerning effects of outcome histories. For example, the amount of allocations made during failure by subjects appears to depend upon the rate and magnitude of the outcomes previously experienced during variable partial reinforcement for allo-

cations. Higher levels of persistence during extinction have been found with higher rates and magnitudes of reinforcement (Goltz, 1999). Individual decision making appears to be more likely to be influenced by magnitude than is group decision making (Seibert & Goltz, in press). In addition, Hantula and Bragger (1999) found that the lowest level of escalation occurs when subjects' outcomes during training are either progressively more positive or progressively more negative after each investment opportunity, compared with outcomes that occur on a fixed or variable partial schedule.

Behavior-analytic studies into reinforcement history effects on escalation have also demonstrated the importance of considering whether other alternatives are available in the escalation situation. Although non-behavior-analytic escalation researchers have looked at this aspect of escalation, these studies yielded mixed results. Staw and Fox (1977) found no reduction of escalation when an alternative was provided, whereas McCain (1986) found the opposite. Because the presentation of multiple alternatives is often found in behavior-analytic investigations, its methods lend themselves well to considering the question of the impact of an available alternative on escalation, and these methods have served to help clarify the confusion. For example, Hantula and Crowell (1994a) used a task in which subjects were entrusted with an imaginary \$10,000 to manage. The task involved two investment alternatives. In Phase 1, both components provided returns at the same rate. In Phase 2, one component, Market B, ceased to yield returns for investing. When this happened, subjects did not persist in Market B, but allocated more resources to Market A, the alternative continuing to provide reinforcement. These results are consistent with the concept of matching (Herrnstein, 1970); individuals distribute responses across alternatives so that they match the proportion of reinforcement received from each alternative. The sec-

ond of two experiments reported by Goltz (1999) speaks to what can happen when both alternatives result in failure. Consistent with the notion of behavioral momentum (e.g., Nevin, 1988), escalation occurred in the alternative that previously resulted in a higher rate of reinforcement. In addition, results of both experiments (Goltz, 1999) suggested that certain outcome dimensions (e.g., rate) will not have an effect on escalation when only one alternative has been presented, but will have an effect when two alternatives differing in that dimension have been presented.

Thus, whether certain reinforcement history effects will be evident or not appears to depend heavily upon whether subjects have other options available and what the reinforcement schedules are for these other options. Decision makers appear to use other options as benchmarks for assessing the optimal allocation of resources. In the absence of options, however, other benchmarks may be used. Recent research by Hantula and Bragger (1999) indicated that escalation resulting from various reinforcement histories can be decreased by providing a standard with which to compare the outcomes being received. In addition, Bragger et al. (1998) found that the availability of summary information on past investments and outcomes affects persistence, with individuals having access to the information exhibiting decreased persistence.

Response Dynamics

Operant-based escalation research not only has generated a number of interesting findings concerning effects of outcome histories but also has changed researchers' understanding of the phenomenon by indicating that studying escalation over time is important. This is due largely to the measurement of escalation over several sequential trials in behavior-analytic escalation studies. As Hantula et al. (1995) noted, both the definition of escalation and proposed models of escalation (e.g., Staw

& Ross, 1987) suggest that the phenomenon occurs over time. An example is Brockner's (1992) definition of escalation situations as involving "repeated decision making in the face of negative feedback about prior resource allocations" (p. 40). Despite this, the examination of the behavior over time was virtually nonexistent in the escalation literature prior to behavior-analytic escalation studies. The one-time single allocation that typically comprised the dependent variable in traditional escalation research (e.g., Bazerman et al., 1984; Staw, 1976; Whyte, 1991) was limited in that it could not reveal the time-dependent nature of the behavior.

The methodology used in operant-based studies of escalation has indicated that, with time, deescalation can be expected to follow escalation (e.g., Goltz, 1992, 1993; Hantula & Crowell, 1994b). For example, in the two Goltz (1992) experiments, although subjects who experienced variable reinforcement persisted longer during extinction, their levels of responding eventually dropped. In both experiments, during the last three (of 12) extinction trials, response levels of these subjects were relatively close to the response levels of subjects who experienced continuous and fixed reinforcement. Also, these studies revealed that effects of some factors that affect escalation are transient, whereas effects of other factors are more enduring. Goltz (1993) found that reinforcement history and responsibility for decision making interacted to influence subjects' allocations immediately following the first of the continuous failure experiences. When escalation was examined across time, however, only reinforcement history continued to account for the behavior. As Hantula and Crowell (1994b) noted, these results challenge traditional views of escalation by suggesting that escalation may not always be readily apparent in a single-trial observation and that it is not a static or linear event.

In contrast to non-behavior-analytic

escalation studies, the collection of within-group as well as between-groups data in operant-based escalation research has allowed researchers to report the generality of effects by calculating the percentage of subjects who escalate, decrease, or do not change their investments from one trial to the next. Behavior-analytic research indicates that, although escalation is not a behavior displayed by all subjects, a substantial percentage of subjects exhibit responses consistent with operant-based predictions. For example, Hantula and Crowell (1994a) found that 5 of 6 subjects exhibited responses consistent with matching. Also, more subjects with histories of variable reinforcement than subjects with histories of fixed or continuous reinforcement have been found to be persistent in making allocations during extinction. Goltz (1992) found that the variable schedule condition contained the largest percentage of subjects who persisted. These subjects invested some money in the stock alternative during 11 of the 12 extinction trials in Experiment 1 and during all trials in Experiment 2. Similarly, results from the initial trials of extinction indicated that between one third and one half of variably reinforced subjects actually increased their allocations during extinction, whereas less than one-tenth of continuously reinforced subjects escalated (Goltz, 1992; Hantula & Crowell, 1994b).

Researchers in both the behavior-analytic and organizational behavior literatures have recognized the importance of behavior-analytic escalation studies in terms of examining escalation in a larger context of outcome and response patterns. O'Flaherty and Komaki's (1992) commentary on Goltz's (1992) study suggested that Goltz's work was unique in that the bulk of studies in both applied behavior analysis and organizational behavior have not explicitly identified the independent variable as a sequence of events. They noted that the independent variable "is typically the principle of pos-

itive reinforcement without any finer distinctions being made" (p. 16). They also recommended that more studies in psychology examine the dependent variable over time. Similarly, after behavior-analytic escalation research began demonstrating the role of decision makers' reinforcement histories, later models and reviews of escalation more explicitly recognized the role of time, noting the behavior-analytic evidence in discussions of models of escalation in the organizational literature (e.g., Staw, 1997; Staw & Ross, 1989). For example, Staw's (1997) recent review discussed a temporal model of escalation and noted that most escalation studies are not longitudinal in nature and therefore cannot adequately test a temporal model. His review, as well as an earlier one (Staw & Ross, 1987), cited behavior-analytic escalation studies as evidence that psychological influences on escalation occur over time as negative outcomes materialize. In addition, he suggested that simulations like that of Goltz (1992, 1993) be used in future research to examine more closely the sequential nature of escalation (Staw, 1997).

ADAPTING METHODS TO BETTER ASSESS ESCALATION AND THE ROLE OF REINFORCEMENT IN VARYING CONTEXTS

A second contribution of the operant-based escalation literature arises from the capacity researchers have shown for adapting and refining methods to better assess decision making and the role reinforcement plays in it. These adaptations include a proposal to reconceptualize the term *escalation* to address discrepancies in the literature and the adoption of techniques designed to simulate the variability of decision-making outcomes.

Reconceptualizing Escalation

Aside from its neglect of decision making within the larger context of reinforcement histories, the single-allo-

cation methodology used in traditional escalation research sometimes resulted in conclusions that escalation had been demonstrated when it arguably had not occurred. Hantula and Crowell (1994b) noted that operationalizing escalation by comparing two groups on allocations made on a single trial has sometimes led researchers to report an escalation effect even though both groups invested less money on the second allocation than on the first (e.g., Conlon & Parks, 1987; Davis & Bobko, 1986). In the Davis and Bobko study, for example, subjects made an original investment of \$20 million (a predetermined amount) and had the resources to freely allocate up to \$20 million in a second decision. One group of subjects, who invested an average of \$10.3 million on the second decision, were said to have escalated relative to other subjects who averaged \$8.3 million the second time, even though both groups actually invested less on the second decision than was invested on the first decision.

To avoid problems with such interpretations, Hantula et al. (1995) suggested that comparisons be made within a group as well as between groups and that allocation behaviors be reconceptualized and consistently operationalized as follows: (a) *escalation*, characterized by a significant increase in investment from one decision to the next; (b) *persistence*, characterized by an allocation on a second decision that is not significantly different from the first allocation; (c) *deescalation*, characterized by a significant decrease in investment from one decision to the next; and (d) *withdrawal*, characterized by a ceasing of investment from one decision to the next. Using these definitions, the interpretation of the research results of Davis and Bobko (1986) are clarified: Subjects who invested \$10.3 million persisted, whereas subjects who invested \$8.3 million deescalated.

Simulating Variability

Although Staw (1997) called for the increased use of simulations to exam-

ine the dynamic aspects of escalation, it can be argued that there are disadvantages with relying wholly on these simulations to study escalation effects. In particular, decisions made in other situations might be quite different than those made by individuals in the simulations. One concern is that decision making in organizations often results in very real and motivating behavioral consequences when compared with decisions made in laboratory investigations (Stolarz-Fantino & Fantino, 1990, 1995). Another concern is that consequences in real organizations are often more variable on a number of dimensions (Goltz, 1999). Although there is a still a need for research examining escalation effects due to reinforcement history in actual organizational contexts with real and motivating consequences, simulations have been adapted to address the concern about variability.

As discussed in Goltz and Northey (1998), early behavior-analytic escalation research presented constant amounts for all positive outcomes and for all negative outcomes. For example, in the Goltz (1993) study, subjects played the role of a top financial officer in a company with declining market share and decided, on a periodic basis, the amount of additional money to allocate to one of two research and development (R&D) departments. They received information on any increases or decreases in market share that occurred after each decision. Changes in market share during acquisition followed a fixed partial schedule of returns for some subjects and a variable partial schedule of returns for other subjects. All subjects saw an increase of 0.15% when investment in R&D resulted in a gain and a decrease of 0.15% when investment resulted in a loss. It could be argued that the use of constant numbers for outcome amounts might make the situation appear to be very artificial, resulting in artificial responses.

Thus, in later studies (Goltz, 1999, Experiments 1 and 2), the task was

modified so that the computer program used a pseudorandom number generation routine to individually generate different amounts for each trial and for each subject within a certain range, while keeping average amounts experienced by subjects constant. For example, amounts of decreases in market share averaged to be 0.15% in all conditions throughout Experiment 1, but the actual decreases presented to subjects ranged from 0.11% to 0.19%. In addition, the computer program randomized when these amounts occurred, so the actual sequence of amounts seen by each subject was different. Even with these variations, significant effects were found for the magnitude manipulation in Experiment 1 and for the rate manipulation in Experiment 2. This method better simulated the characteristics of actual outcomes and arguably increased the external validity of research results in at least two ways (Goltz & Northey, 1998). First, one could argue that these magnitude and rate effects are likely to generalize to situations outside the laboratory in which there is a lot of noise in the feedback individuals experience, for example, when amounts of increases or decreases fluctuate. Second, one could argue that the results are likely to occur even when the particular patterns of outcomes experienced differ across individuals. In contrast, it is difficult to argue that effects will hold under these conditions when outcome amounts have been kept constant in the experiment, such as was the case in the earlier study (Goltz, 1993).

PROVIDING ADDITIONAL RESEARCH QUESTIONS FOR THE BEHAVIOR ANALYSIS OF ORGANIZATIONAL DECISION MAKING

Behavior-analytic escalation research is exciting in that it has demonstrated that reinforcement principles apply to humans in work settings performing complex tasks. As reviews of the literature suggest, much of previous

behavior analysis in the area of management has been successful, but has demonstrated the success of operant techniques in circumscribed situations, such as production, training, sales, safety, and absenteeism (e.g., Frederiksen, 1982). In comparison, the behavior analysis of escalation has extended the generalizability of reinforcement effects such as the PRE effect (Goltz, 1992; Hantula & Crowell, 1994b) and matching (Goltz, 1999; Hantula & Crowell, 1994a) to additional levels of complexity (e.g., humans performing decision-making tasks, humans making decisions in groups). These findings are encouraging to behavior-analytic researchers who seek to assess the utility of reinforcement principles for predicting more complex human behavior. Largely due to the more complex situations being analyzed, however, this research has also raised additional questions. Behavior-analytic escalation research has pointed out some of the limits of knowledge in the field of behavior analysis and the resulting challenges inherent in trying to use operant principles to analyze human decision making in organizations. Factors that have not received much research attention in studies of basic reinforcement effects might be particularly important to understanding decision making in organizations. Areas that could use further exploration include how individuals use different sequences of past events to predict future events, how the variability of different outcome dimensions affects decisions, and the degree to which rule following governs organizational decision making. Investigation of these areas should help behavior-analytic researchers to assess the appropriateness of their models of behavior for understanding and predicting human decision making.

Event Chunking

One result of behavior-analytic investigations of escalation is that speculations have arisen as to the underly-

ing reasons for the effects. Researchers using Bayesian techniques to analyze the data in these studies have suggested that subjects in Goltz's (1992, 1993) and Hantula and Crowell's (1994b) escalation experiments responded according to two- or three-event sequences (e.g., DiFonzo & Hantula, 1995; O'Flaherty & Komaki, 1992). According to this analysis, subjects appeared to group the two or three outcomes immediately preceding a response (e.g., RNR or NNR, where N is nonreinforcement and R is reinforcement) and use this grouping as a stimulus that signals the likelihood that a response in the situation would be followed by reinforcement. Admittedly, the application of Bayesian techniques such as found in O'Flaherty and Komaki is limited in that the techniques constitute a mathematical representation of behavior that does not directly identify the variables that are responsible for behavior. However, this analysis is consistent with the sequential hypothesis of instrumental learning (Capaldi, 1966, 1967) that suggests that subjects chunk individual events into larger functional units using cues such as space and time in order to increase the accuracy of their prediction of future events. Chunking is thought to occur in response to a second-order schedule that is operating in a situation. A second-order schedule occurs when a first-order schedule is reinforced according to some other schedule (Capaldi, 1992). As Capaldi (1992) stated, "a second-order schedule in an organizational or business setting might be that of learning that an irregular run of losses is followed by a series of wins" (p. 576). Thus, chunking is thought to be a response that occurs because it is reinforced with an increase in prediction accuracy, resulting in the ability to obtain increased outcomes over the long run. The investigation of how and when subjects chunk events to make predictions about the likelihood of outcomes may be critical to a deeper understanding of human decision-making behavior. For example, decision-mak-

ing behavior in organizations that is perplexing to researchers who have focused primarily on first-order schedules of reinforcement may be better understood when the situation is examined more closely to identify possible higher order schedules that are operating.

Variability Effects

Another result of behavior-analytic escalation research is that it has called attention to the importance of examining reinforcement variability in decision making. When changes in methods were made by Goltz (1999) from using constant outcome amounts to variable outcome amounts to increase the generalizability of results, the nature of subjects' responses also changed.

Recent studies indicate that subjects are able to accurately predict chaotic and random sequences of outcomes as they are occurring (e.g., Neuringer & Voss, 1993; Smithson, 1997). Related to this, operant research indicates that there is a preference for variable delays of reinforcement delivery over fixed delays (Herrnstein, 1964; Rider, 1983), for variable ratios of reinforcement over fixed ratios (Fantino, 1967), and in some cases for uncertain large reinforcers over certain small reinforcers (Young, 1981). Other studies suggest that preferred outcomes in choice procedures also increase resistance to change in multiple schedules (Mellon & Shull, 1986; Nevin & Grace, 1996). When taken together, this research implies that increased uncertainty in various reinforcement dimensions (delay, magnitude), which appears to be preferred by most subjects, might increase resistance to change. Behavior-analytic escalation research suggests this as well. In early studies with constant outcome amounts (Goltz, 1992, 1993), subjects in different conditions had differentially decreasing rates of responding during the continuous negative outcomes. In contrast, when the variability in amounts was introduced to make

outcomes appear more realistic, the investment levels did not decline in any of the conditions from levels exhibited during training (Goltz, 1999, Experiment 1). This occurred even though subjects received losses for investing in R&D for 19 trials.

Two recent behavior-analytic studies of decision making more directly examined whether increased uncertainty in various reinforcement dimensions (delay, magnitude) increases resistance to change. Goltz (1999, Experiment 2) manipulated the variability of the amounts of the outcomes subjects saw. Mean outcomes were kept constant across conditions while the variation in actual amounts presented was manipulated. The results indicated that the variability manipulation explained a substantial amount of the variance in subjects' allocations during extinction, with the effect size found for variability being higher than the effect size for reinforcement rate. Subjects who had previously experienced more variable outcomes in terms of magnitude were found to be more persistent in a failing course of action. Braggar et al. (1998) found similar variability effects on escalation. They manipulated the variance of feedback subjects received while keeping both the means and the autocorrelations among outcomes constant across subjects. Subjects receiving outcomes with a higher variance delayed their exit decisions to a greater degree and also invested more total resources than did subjects who received outcomes with a lower variance. Thus, these studies suggest that variability in outcome amount is an important factor that should continue to be examined.

Another implication of these results is that behavior analysis could be used to study the concept of uncertainty in the economic literature (e.g., Hirshleifer & Glazer, 1992). Economic and organizational studies of risk aversion are limited in that they have usually measured choice behavior at a single point in time and have explicitly stated amounts and probabilities (Rachlin et al., 1986). Skinner (1966) cautioned

that subjects don't necessarily respond to descriptions of contingencies in the same way as they respond to actual contingencies. Thus, the use of methods that allow subjects to actually experience and determine for themselves over repeated events the level of uncertainty inherent in the situation could lead to a better understanding of more naturally occurring economic choice behavior. Furthermore, behavior-analytic research into risk and uncertainty could assess effects of different types of uncertainty on economic behavior by varying the range, mean, or type of distribution of a number of outcome dimensions (e.g., magnitude, delay, duration).

Rule Following

Much of organizational decision making is thought to be based on rule following (Zhou, 1997). Rules abound in the area of investment decisions, such as "buy and hold" and "sell when losses reach x ." Rules usually stipulate a set of responses and sometimes also indicate under what conditions the responses should occur (i.e., the discriminative stimulus). Results of one behavior-analytic escalation study have suggested a need for research into the possibility that escalation results from the use of a rule. In Experiment 2 of Goltz's (1992) study, subjects who received no training on the task behaved similarly to subjects who received a history of variable reinforcement. This could have resulted from subjects using discriminative stimuli that occurred in the decision situation to generalize a rule derived from previous experiences associated with variable reinforcement, such as "just buy and hold" (Goltz, 1992). This would be consistent with the suggestion by some researchers that human decision-making errors may be due to the misapplication of covert verbal rules. This suggestion is based on data that show that humans and pigeons do not always respond alike and the conclusion by some researchers that this indicates

that pigeons' responses are more influenced by environmental events than are human responses (e.g., Goodie & Fantino, 1995; Takahashi & Iwamoto, 1986). However, other researchers have suggested that this conclusion is premature for a number of reasons, including procedural differences between experiments on human behavior and those on nonhuman behavior (e.g., Madden, Chase, & Joyce, 1998). Future research is needed to ascertain whether rule following plays a role in escalation and other decision-making behaviors. One possibility is that each rule is associated with a different higher order schedule and that decision makers use rules for the same reason that has been hypothesized for why they might chunk events—because of a resulting ability to obtain increased reinforcement over the long run. Knowing how subjects use or misuse these rules may lead to an increased understanding of behaviors that are perplexing when only current environmental contingencies are examined.

CONCLUSION

The study of escalation has presented new frontiers for applying behavior analysis to organizational behavior. This area of research has resulted in a more dynamic and contextual view of escalation in the organizational literature, has resulted in the refinement of methods for examination of the phenomenon, and has suggested a number of additional research avenues for behavior analysis. For example, escalation and deescalation are now viewed in a larger context of an individual's reinforcement history. In addition, reinforcement effects on escalation have been found even when variability of outcomes occurs within and between individuals, extending the effects to a wider variety of contexts. Research has pointed out some of the limits of knowledge in the field of behavior analysis, however. Areas that need future research attention include how outcomes are sequenced, how the un-

certainty of different outcome dimensions affect decisions, and how rule following is used in organizational decision making.

REFERENCES

- Amsel, A. (1967). Partial reinforcement effects on vigor and persistence: Advances in frustration theory derived from a variety of within-subjects experiments. In K. W. Spence & J. T. Spence (Eds.), *The psychology of learning and motivation* (Vol. 1, pp. 1–65). New York: Academic Press.
- Arkes, H. R., & Blumer, C. (1985). The psychology of sunk cost. *Organizational Behavior and Human Decision Processes*, 35, 124–140.
- Armstrong, J. S., Coviello, N., & Safranek, B. (1993). Escalation bias: Does it extend to marketing? *Journal of the Academy of Marketing Sciences*, 21, 247–253.
- Bazerman, M., Giuliano, T., & Appelman, A. (1984). Escalation of commitment in individual and group decision making. *Organizational Behavior and Human Performance*, 33, 141–152.
- Bragger, J. D., Bragger, D., Hantula, D. A., & Kirnan, J. (1998). Hysteresis and uncertainty: The effect of uncertainty on delays to exit decisions. *Organizational Behavior and Human Decision Processes*, 74, 229–253.
- Brockner, J. (1992). The escalation of commitment to a failing course of action: Toward theoretical progress. *Academy of Management Review*, 17, 39–61.
- Capaldi, E. J. (1966). Partial reinforcement: A hypothesis of sequential effects. *Psychological Review*, 73, 459–477.
- Capaldi, E. J. (1967). A sequential hypothesis of instrumental learning. In K. W. Spence & J. T. Spence (Eds.), *The psychology of learning and motivation* (Vol. 1, pp. 67–156). New York: Academic Press.
- Capaldi, E. J. (1992). The organization of behavior. *Journal of Applied Behavior Analysis*, 25, 575–577.
- Case, D. A., Ploog, B. O., & Fantino, E. (1990). Observing behavior in a computer game. *Journal of the Experimental Analysis of Behavior*, 54, 185–199.
- Conlon, E. J., & Parks, J. M. (1987). Information requests in the context of escalation. *Journal of Applied Psychology*, 72, 344–350.
- Davis, M. A., & Bobko, P. (1986). Contextual effects on escalation processes in public sector decision making. *Organizational Behavior and Human Decision Processes*, 37, 121–138.
- DiFonzo, N., & Hantula, D. A. (1995). *Why some people escalate investments in failing courses of action: Bayesian updating*. Paper presented at the convention of the American Psychological Society, New York.
- Drummond, H. (1996). *Escalation in decision-*

- making: The tragedy of Taurus*. Oxford: Oxford University Press.
- Eubanks, J. L., & Lloyd, K. E. (1992). Relating behavior analysis to the organizational culture concept and perspective. *Journal of Organizational Behavior Management*, 12, 27-44.
- Fantino, E. (1967). Preference for mixed- versus fixed-ratios. *Journal of the Experimental Analysis of Behavior*, 10, 35-43.
- Fantino, E. (1998). Judgment and decision making: Behavioral approaches. *The Behavior Analyst*, 21, 203-218.
- Fantino, E., & Case, D. A. (1983). Human observing: Maintained by stimuli correlated with reinforcement but not extinction. *Journal of the Experimental Analysis of Behavior*, 40, 193-210.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University Press.
- Fox, W. M. (1987). *Effective group problem solving*. San Francisco: Jossey-Bass.
- Frederiksen, L. W. (1982). Organizational behavior management: An overview. In L. W. Frederiksen (Ed.), *Handbook of organizational behavior management* (pp. 3-20). New York: Wiley.
- Garland, H., Sandefur, C. A., & Rogers, A. C. (1990). De-escalation of commitment in oil exploration: When sunk costs and negative feedback coincide. *Journal of Applied Psychology*, 75, 921-927.
- Goltz, S. M. (1992). A sequential learning analysis of continued investments of organizational resources in nonperforming courses of action. *Journal of Applied Behavior Analysis*, 25, 561-574.
- Goltz, S. M. (1993). Examining the joint roles of responsibility and reinforcement history in recommitment. *Decision Sciences*, 24, 977-994.
- Goltz, S. M. (1999). Can't stop on a dime: The roles of matching and momentum in persistence of commitment. *Journal of Organizational Behavior Management*, 19, 37-63.
- Goltz, S. M., & Northey, J. E. (1998). Simulating the variability of actual outcomes. *Behavior Research Methods, Instruments, and Computers*, 30, 680-689.
- Goodall, K. (1972, November). Shapers at work. *Psychology Today*, 53-132.
- Goodie, A. S., & Fantino, E. (1995). An experimentally derived base-rate error in humans. *Psychological Science*, 6, 101-106.
- Guzzo, R. A., & Salas, E. (1995). *Team effectiveness and decision making in organizations*. San Francisco: Jossey-Bass.
- Hantula, D. A. (1992). The basic importance of escalation. *Journal of Applied Behavior Analysis*, 25, 579-583.
- Hantula, D. A. (1995). Disciplined decision making in an interdisciplinary environment: Some implications for clinical applications of statistical process control. *Journal of Applied Behavior Analysis*, 28, 371-377.
- Hantula, D. A., & Bragger, J. L. D. (1999). The effects of feedback equivocality on escalation of commitment: An empirical investigation of decision dilemma theory. *Journal of Applied Social Psychology*, 29, 424-444.
- Hantula, D. A., & Crowell, C. R. (1994a). Behavioral contrast in a two-option analogue task of financial decision making. *Journal of Applied Behavior Analysis*, 27, 607-617.
- Hantula, D. A., & Crowell, C. R. (1994b). Intermittent reinforcement and escalation processes in sequential decision making: A replication and theoretical analysis. *Journal of Organizational Behavior Management*, 14, 7-36.
- Hantula, D. A., DeNicolis, J. L., & Goltz, S. M. (1995, April). *What is escalation and persistence of commitment? A critical examination of the construct*. Paper presented at the 1995 meetings of the Eastern Academy of Management, Buffalo, NY.
- Hardin, G. (1968). The tragedy of the commons. *Science*, 162, 1243-1248.
- Harrison, P. D., & Harrell, A. (1993). Impact of "adverse selection" on managers' project evaluation decisions. *Academy of Management Journal*, 36, 635-643.
- Herrnstein, R. J. (1964). Aperiodicity as a factor in choice. *Journal of the Experimental Analysis of Behavior*, 7, 179-182.
- Herrnstein, R. J. (1970). On the law of effect. *Journal of the Experimental Analysis of Behavior*, 13, 243-266.
- Herrnstein, R. J. (1990). Rational choice theory: Necessary but not sufficient. *American Psychologist*, 45, 356-367.
- Hirshleifer, J., & Glazer, A. (1992). *Price theory and applications*. Englewood Cliffs, NJ: Prentice Hall.
- Kahneman, D., & Tversky, A. (1984). Choice, values, and frames. *American Psychologist*, 39, 341-350.
- Komaki, J. L. (1986). Applied behavior analysis and organizational behavior: Reciprocal influence of the two fields. In L. L. Cummings & B. M. Staw (Eds.), *Research in organizational behavior* (Vol. 8, pp. 297-334). Greenwich, CT: JAI Press.
- Madden, G. J., Chase, P. N., & Joyce, J. H. (1998). Making sense of sensitivity in the human operant literature. *The Behavior Analyst*, 21, 1-12.
- Mawhinney, T. C. (1986). OBM, SPC, and Theory D: A brief introduction. *Journal of Organizational Behavior Management*, 8, 89-105.
- Mawhinney, T. C. (1992). Evolution of organizational cultures as selection by consequences: The Gaia hypothesis, metacontingencies, and organizational ecology. *Journal of Organizational Behavior Management*, 12(2), 1-26.
- Mawhinney, T. C. (1995, May). *Little momentary effects that produce cumulatively large economic consequences in industrial settings: Costing metacontingencies of chronic absenteeism*. Paper presented at the annual meetings

- of the Association for Behavior Analysis, Washington, DC.
- McCain, B. E. (1986). Continuing investment under conditions of failure: A laboratory study on the limits to escalation. *Journal of Applied Psychology*, 71, 280-284.
- Mellon, R. C., & Shull, R. L. (1986). Resistance to change produced by access to fixed-delay vs. variable-delay terminal links. *Journal of the Experimental Analysis of Behavior*, 46, 79-92.
- Neuringer, A., & Voss, C. (1993). Approximating chaotic behavior. *Psychological Science*, 4, 113-119.
- Nevin, J. A. (1988). Behavioral momentum and the partial reinforcement extinction effect. *Psychological Bulletin*, 105, 44-56.
- Nevin, J. A., & Grace, R. C. (1996). A relation between preference and resistance to change. Paper presented at the conference of the Society for the Quantitative Analysis of Behavior, San Francisco.
- Northcraft, G. B., & Neale, M. A. (1986). Opportunity costs and framing of resource allocation decisions. *Organizational Behavior and Human Decision Processes*, 37, 348-356.
- O'Flaherty, B., & Komaki, J. L. (1992). Going beyond with Bayesian updating. *Journal of Applied Behavior Analysis*, 25, 585-597.
- Platt, J. R. (1973). Social traps. *American Psychologist*, 28, 641-651.
- Rachlin, H. (1989). Decision and choice reconciled. In R. C. Atkinson, G. Lindzey, & R. F. Thompson (Eds.), *Judgment, decision, and choice: A cognitive/behavioral synthesis* (pp. 247-282). New York: Freeman.
- Rachlin, H. (1990). Why do people gamble and keep gambling despite heavy losses? *Psychological Science*, 1(5), 294-297.
- Rachlin, H., Logue, A. W., Gibbon, J., & Frankel, M. (1986). Cognition and behavior in studies of choice. *Psychological Review*, 93, 33-45.
- Rider, D. P. (1983). Preference for mixed versus constant delays of reinforcement: Effect of probability of the short, mixed delay. *Journal of the Experimental Analysis of Behavior*, 39, 257-266.
- Ross, J., & Staw, B. M. (1993). Organizational escalation and exit: Lessons from the Shoreham nuclear power plant. *Academy of Management Journal*, 36, 701-732.
- Schoorman, F. D. (1988). The escalation bias in performance appraisals: An unintended consequence of supervisor participation in hiring decisions. *Journal of Applied Psychology*, 73, 58-62.
- Seibert, S., & Goltz, S. M. (in press). A comparison of allocations of individuals and interacting groups in an escalation situation. *Journal of Applied Social Psychology*.
- Shapira, Z. (1997). *Organizational decision making*. New York: Cambridge University Press.
- Skinner, B. F. (1966). Operant behavior. In W. K. Honig (Ed.), *Operant behavior: Areas of research and application* (pp. 12-32). New York: Appleton-Century-Crofts.
- Smithson, M. (1997). Judgment under chaos. *Organizational Behavior and Human Decision Processes*, 69, 59-66.
- Staw, B. M. (1976). Knee-deep in the big muddy: A study of escalating commitment to a chosen course of action. *Organizational Behavior and Human Performance*, 16, 27-44.
- Staw, B. M. (1997). The escalation of commitment: An update and appraisal. In Z. Shapira (Ed.), *Organizational decision making* (pp. 191-215). New York: Cambridge University Press.
- Staw, B. M., Barsade, S. G., & Koput, K. W. (1995). *Escalation at the credit window: A longitudinal study of bank executives' recognition and write-off of problem loans*. Working paper, Haas School of Business, University of California, Berkeley.
- Staw, B. M., & Fox, F. V. (1977). Escalation: The determinants of commitment to a course of action. *Human Relations*, 30, 431-450.
- Staw, B. M., & Hoang, H. (1995). Sunk costs in the NBA: Why draft order affects playing time and survival in professional basketball. *Administrative Sciences Quarterly*, 40, 474-494.
- Staw, B. M., & Ross, J. (1978). Commitment to a policy decision: A multi-theoretical perspective. *Administrative Sciences Quarterly*, 23, 40-64.
- Staw, B. M., & Ross, J. (1987). Behavior in escalation situations: Antecedents, prototypes, and solutions. In L. L. Cummings & B. M. Staw (Eds.), *Research in organizational behavior* (Vol. 9, pp. 39-78). Greenwich, CT: JAI Press.
- Staw, B. M., & Ross, J. (1989). Understanding behavior in escalation situations. *Science*, 246, 216-220.
- Stolarz-Fantino, S., & Fantino, E. (1990). Cognition and behavior analysis: A review of Rachlin's *Judgment, Decision, and Choice*. *Journal of the Experimental Analysis of Behavior*, 54, 317-322.
- Stolarz-Fantino, S., & Fantino, E. (1995). The experimental analysis of reasoning: A review of Gilovich's *How We Know What Isn't So*. *Journal of the Experimental Analysis of Behavior*, 64, 111-116.
- Takahashi, M., & Iwamoto, T. (1986). Human concurrent performances: The effects of experience, instructions, and schedule-correlated stimuli. *Journal of the Experimental Analysis of Behavior*, 45, 257-267.
- Teger, A. L. (1980). *Too much invested to quit*. New York: Pergamon Press.
- Wechsler, D. (1989, April 17). Letting the losses run. *Forbes*, p. 116.
- Weiss, H. M. (1990). Learning theory and industrial and organizational psychology. In M. D. Dunnette & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (2nd ed., Vol. 1, pp. 171-221). Palo

- Alto, CA: Consulting Psychologists Press, Inc.
- Whyte, G. (1991). Diffusion of responsibility: Effects on the escalation tendency. *Journal of Applied Psychology*, 76, 408–415.
- Whyte, G., Saks, A. M., & Hook, S. (1997). When success breeds failure: The role of self-efficacy in escalating commitment to a losing course of action. *Journal of Organizational Behavior*, 18, 415–432.
- Young, J. S. (1981). Discrete-trial choice in pigeons: Effects of reinforcer magnitude. *Journal of the Experimental Analysis of Behavior*, 35, 23–29.
- Zhou, X. (1997). Organizational decision making as rule following. In Z. Shapira (Ed.), *Organizational decision making* (pp. 257–281). New York: Cambridge University Press.