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Differential Latency and Selective Nondisclosure In Verbal Self-Reports

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Several previous studies have examined the correspondence between self-reports and the delayed identity match-to-sample performance they supposedly described. The present two experiments used similar procedures to explore different characteristics of the self-reports. In both studies, match-to-sample responses were successful (earned points) if they were both correct and faster than a time limit. Following each response, a computer-presented query asked whether the response had been successful, and subjects replied by pressing a "Yes" or "No" button. Experiment 1 analyzed self-report latencies from a previously-published study (Critchfield, 1993a). Latencies generally were longer for self-reports of failure than for self-reports of success. In Experiment 1, a "Yes" or "No" self-report was required to advance the session. In Experiment 2, self-reports were optional. In addition to "Yes" and "No" buttons, subjects could press a third button (a "nondisclosure" option) to remove the self-report query without providing a "Yes" or "No" answer. Across a range of conditions, nondisclosures always occurred more frequently after match-to-sample failures than after successes (i.e., under conditions in which a self-report of failure would be appropriate). The effects observed in the two experiments are consistent with a history of differential punishment for uncomplimentary self-reports, which casual observation and some descriptive studies suggest is a common experience in United States culture. The research necessary to explore this notion should produce data that are of interest to psychologists both within and outside of Behavior Analysis.

Skinner's (1957) *Verbal Behavior* may be most commonly viewed as an attempt to delineate relations unique to verbal behavior, but the analysis it contains rests firmly on the assumption that verbal relations reflect the same fundamental principles as other (primarily nonverbal) behavior that has been studied extensively in the laboratory. A thoroughgoing empirical evaluation of Skinner's analysis has been slow in coming. Much has been written about the relative scarcity of empirical investigations involving Skinner's "primary verbal operants" (e.g., Hake, 1982; Oah & Dickinson, 1989; Dougherty, 1994; McPherson, Bonem, Green & Osborne, 1984; Sundberg, 1991), but Skinner's core assumption also bears further scrutiny. It is well established that vocalization can be brought under operant control, but many of the relevant studies were conducted and interpreted with something other than Skinner's (1957) analysis in mind (e.g., Holz & Azrin, 1966; Salzinger & Salzinger, 1967) and, although numerous, these studies demonstrate a fairly limited range of effects.

A number of recent studies on verbal self-reports conducted in my laboratory, although not designed explicitly to evaluate Skinner's analysis, have shared its basic precept about operant control of verbal behavior. My colleagues and I have attempted to develop methods in which self-reports could be readily studied as operant behavior, in the sense that important antecedents and consequences of both self-reports and their presumed referents were under experimental control (e.g., Critchfield, 1993a, 1993b, 1994, 1996; Critchfield & Perone, 1990, 1993; Lane &

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Critchfield, 1996). These studies have sought to quantify the correspondence between simple self-reports and their presumed referents, and to identify variables affecting that correspondence.

Structurally speaking, the approach has been relatively simple. The entire task is automated. Subjects perform, and make self-reports about, a delayed match-to-sample (DMTS) task. This performance has been useful as a "referent" because its characteristics can be controlled by manipulating a variety of factors, including stimulus difficulty, time pressure, and reinforcement contingencies (e.g., Baron & Menich, 1985). Self-reports occur as "YES" or "NO" responses to a query about the success of the preceding DMTS response. Separate reinforcement contingencies can be established to ensure the emission of self-reports, and the range of possible self-report topographies is restricted to avoid the difficulties inherent in coding and interpreting open-ended narrative responses.

Because the procedure is structurally similar to those used in signal-detection paradigms (e.g., Green & Swets, 1966), it has proven useful in evaluating whether self-reports about behavior share characteristics with reports about the occurrence of external stimuli. Preliminary indications are that they do. For example, the extent and direction of bias in self-reports appears to be a function of the frequency of occurrence of the referent response (e.g., Critchfield, 1993a, 1994, 1996; Critchfield & Perone, 1993), just as bias in reports about external stimuli is a function of stimulus frequency (e.g., Craig, 1979; McCarthy & Davison, 1981). In this sense, verbal behavior was found to function similarly to other kinds of behavior, as Skinner supposed.

The present report describes two extensions of the self-report research just summarized. Both studies employed variations of the methods I have used previously, but with different emphases. First, my previous studies all have focused on report-referent correspondence. Experiment 1 searched instead for patterns in the latencies of self-reports. Second, my previous studies all have employed a strictly trials-based procedure in which self-reports were generated as a forced-choice ("YES" or "NO") responses. Experiment 2 took a small step toward a free-operant approach, in which self-reports may occur or not depending on the circumstances. Although the studies described here are preliminary and have a substantial methodological emphasis, their data also provide food for thought (in the General Discussion) regarding some of Skinner's (1957) general assumptions about verbal behavior, specifically regarding the effects of a history of punishment on patterns of self-disclosure.

GENERAL METHOD

Subjects and Apparatus

Undergraduate students volunteered to participate in exchange for bonus credit in psychology classes based on their hours of participation. During sessions, they accumulated points which served as chances in a drawing for cash prizes. Subjects worked alone in a small room containing a table, chair, and response console (described by Critchfield & Perone, 1990) with a monochrome video monitor resting on it. Subjects performed a delayed identity matching-to-sample (DMTS) task using four round, illuminable response keys arranged horizontally near the bottom of the console's sloping front panel. They made self-reports about their DMTS performance using two pushbuttons, each mounted to a small box extending from each side of the console. A microcomputer outside the work room controlled experimental events and collected the data.

Procedure

Trial format. The procedure employed a delayed identity match-to-sample (DMTS) task, described below. During the main experiment, each trial consisted of one DMTS response followed immediately, when scheduled, by a self-report, feedback about the success of the DMTS response, and consequences contingent on the self-report. Each trial was followed by a 1-s intertrial interval (ITI), after which subjects could initiate the next trial. Throughout

the trial, error messages discouraged responses not conforming to the experimental protocol (for details, see Critchfield & Perone, 1990).

The video screen was divided into an upper box, used for the DMTS task, and a lower box, used for with the self-report portion of each trial. At the start of each trial the four buttons on the console's front became illuminated and the message "HOLD LIGHTED BUTTONS DOWN" appeared in the center of the upper box on screen. Simultaneously depressing all four buttons cleared the message and produced, in the center of the DMTS box on screen, an 800-ms sample-stimulus display consisting of one or more stimuli (Figure 1, Panel A). The buttons remained depressed until used to select a comparison stimulus. Following a 1-s delay during which the DMTS box was blank (Panel B), comparison stimuli appeared in locations corresponding to at least two of the four depressed buttons (Panel C). One comparison stimulus always matched one sample element. The stimuli – both matching and distractor items – changed across trials (see "Stimuli" below). Subjects attempted to select the matching comparison stimulus by releasing the round button corresponding to it. A successful response was recorded if a correct choice occurred within 800 ms of the appearance of the comparison stimuli. No stimulus change indicated when the time limit had elapsed.

Immediately after the choice, the DMTS box on screen cleared and, when scheduled, a self-report procedure began. Details of the self-report procedure varied across experiments, but in both experiments, the center of the self-report box on the subject's screen displayed the query, "Did you score?" (the word "score" was used throughout the experiment in feedback messages signaling point delivery). Below the query, the labels "<–YES" and "NO–>" appeared 1 cm from the right and left sides of the self-report box, respectively (Figure 1, Panel D). Pressing the button attached to the console's left side registered a "Yes" report, and pressing the button attached to the console's right side registered a "No"

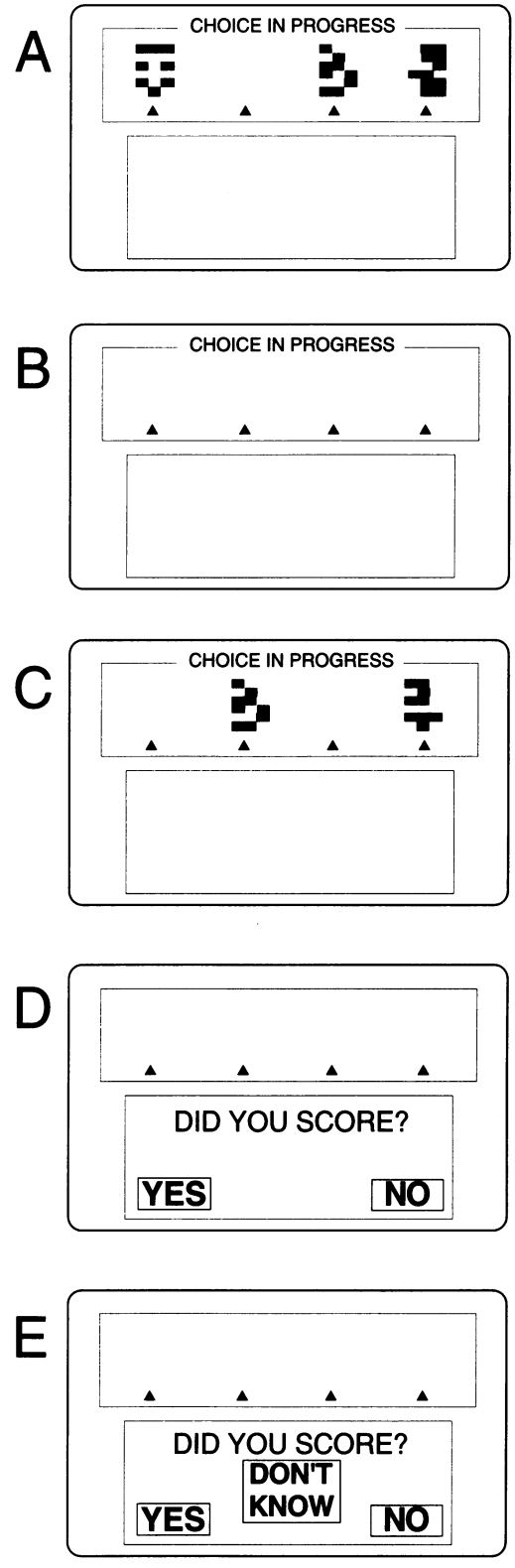

Fig. 1. Summary of the subject's display. Panels A, B, and C illustrate events during the DMTS trial, and Panels D and E show prompts used to generate self-reports. See text for details.

report. Other buttons were ineffective except as noted in Experiment 2. Once a self-report was made, the trial advanced to any scheduled feedback messages, or to the ITI if no feedback was scheduled.

Feedback messages about the success of the DMTS response incorporated three statements shown simultaneously for 1 s in the DMTS area of the screen. The first message stated, "Your choice was CORRECT [or WRONG]." The second message stated "Your choice was FAST ENOUGH [or TOO SLOW]". The third message summarized the implications of the other messages for point reinforcement, stating either, "YOU SCORED! *X* points added to your total," or, "NO SCORE." (the value of *X* depended on the experiment).

DMTS stimuli. Each sample and comparison stimulus consisted of a 6 by 3 matrix of rectangular cells, of which as few as 3 or as many as 18 could be illuminated (Figure 1, Panels A and C). A stimulus could be as large as 10 by 7 mm, depending on how many cells were illuminated. On each trial, stimuli were drawn randomly from a pool of several thousand unique shapes, without replacement except for the obvious exception that one sample stimulus always matched one comparison stimulus.

The four screen locations used to present stimuli were arranged horizontally approximately 2 cm apart, each underscored with a small illuminated dot. The entire stimulus array appeared centered within the DMTS box. If the number of sample or comparison stimuli was less than four, unused locations were left blank (e.g., Figure 1, Panel A). On such occasions, the locations actually used were randomly determined on each trial. Upon display of the comparison stimuli, if a subject released a button corresponding to an unused stimulus location, the trial was canceled, the screen cleared, and a 4-s message stated, "Illegal action! You cannot choose a blank." The trial then restarted using new stimuli.

Session format. In sessions lasting 100 trials (about 8 to 12 min), 50-trial blocks were separated by a 10-s intermission during which the screen was blank except for a message stating, "Intermission – Please wait." Subjects usually completed 8 sessions during each 2 hr visit to the laboratory, allowing for brief subject-initiated rest periods between the sessions. At the end of each session, a message on the subject's screen displayed the number of points accumulated during that session. The message included an overall session total, and subtotals reflecting the number of points earned from DMTS and the number of points accumulated from self-reports. The self-report total was further broken down into total point gains and total point losses.

Preliminary training. Just before the start of the first experimental session, subjects signed an informed consent agreement and read printed instructions. Those used in Experiment 1 have been described previously (Critchfield, 1993a), but were similar to those used in Experiment 2, reproduced in Appendix A. An eight-session preliminary training phase then was used to familiarize subjects with the DMTS task. Preliminary training adhered to the general procedures just described with the following exceptions. No self-reports occurred, and subjects first gained experience with trials employing 13 alphanumeric characters (e.g., #, >, and &) as stimuli. Feedback messages lasted 2 s instead of 1 s. At the beginning of the first session, the time limit for DMTS choices was 3000 ms, and gradually decreased across blocks of 50 trials until the terminal value of 800 ms was reached. Other details of preliminary training for Experiment 1 were described by Critchfield (1993a). Other details of preliminary training for Experiment 2 will be described shortly.

Experimental conditions. Each experimental condition lasted 8 sessions. The first three sessions consisted solely of DMTS trials without self-reports, and the remaining sessions incorporated the self-report procedure. Conditions were defined, and named, according to the number of sample and comparison stimuli appearing on each trial. Across conditions, the difficulty of the DMTS task was manipulated via the number of nonmatching sample stimuli (N = 0

to 3) and comparison stimuli (N = 1 to 3) present on each trial. Stimuli other than the matching item served as distractors (e.g., Figure 1, Panels A and C). For example, when 3 sample stimuli were presented, 1 of which appeared among 2 comparison stimuli (as in Figure 1), the condition was designated as "32," with the first digit describing the number of samples and the second the number of comparisons.

EXPERIMENT 1

Recent studies from my laboratory have drawn rough empirical parallels between verbal self-reports and the reports of external stimuli that take place in psychophysical studies. In particular, signal-detection analyses (Green & Swets, 1966) revealed in verbal self-reports several orderly patterns that were not apparent in the more traditional dependent measure of percent correct (e.g., Critchfield, 1993a, 1993b, 1994, 1996). Signal-detection analysis evaluates the correspondence between two classes of events, normally subject reports and a target stimulus event. As applied here, the analysis focuses on the proportion of responses falling into categories defined as in Figure 2. The present data were collected as part of a previously-described

		DMTS RESPONSE	
		Successful	Unsuccessful
SELF-REPORT	"I succeeded"	HIT	FALSE ALARM
	"I failed"	MISS	CORRECT REJECTION

Fig. 2. Contingency matrix showing self-reports of DMTS success as a function of actual success. Cells are labelled using labels derived from signal-detection theory.

experiment (Critchfield, 1993a). In each condition of that study, rates of self-reports in the categories shown in Figure 2 were used to calculate indices of self-report bias and discriminability, which revealed a variety of effects not evident in the more global measure of self-report accuracy. By analyzing self-report latencies, the present report examines whether a different characteristic of the same self-reports, made by the same subjects, also showed orderly patterns when analyzed according to the categories of Figure 2.

METHOD

A full accounting of the methods can be found in Critchfield (1993a). Ten college students each participated in at least 8 experimental conditions defined according to the number of nonmatching sample and comparison stimuli present on each trial. In the nomenclature introduced in the General Methods, these eight conditions were 22, 23, 24, 32, 33, 34, 42, and 43.

Conditions lasted 8 sessions. The first three sessions of each condition consisted solely of DMTS trials. No self-reports occurred, and feedback followed each DMTS response. Successful DMTS responses were worth 2 points. Session 4 was intended to enhance self-report accuracy. On every trial, a self-report followed the DMTS response. After the self-report, subjects received feedback about the accuracy of the self-report, and then feedback about the success of the DMTS response. Accurate self-reports produced a 1 point gain, and inaccurate self-reports produced a 1-point loss. Successful DMTS responses were worth 1 point. Sessions 5 through 8 provided the data for the experiment. A self-report followed each DMTS response. No DMTS feedback occurred, although subjects continued to accrue 1 point for each successful DMTS response. Accurate self-reports produced a 3-point gain, and inaccurate self-reports produced a 3-point loss, on a random-ratio 3 schedule. No temporal contingencies were placed on emission of self-reports. Self-report latency was measured, in milliseconds, from the appearance of the self-report query ("Did you score?") until the depression of a self-report button. Post-hoc tests showed that the primary dependent measures of the study, DMTS performance and self-report accuracy, usually became stable within the 400 probe trials conducted in each condition.

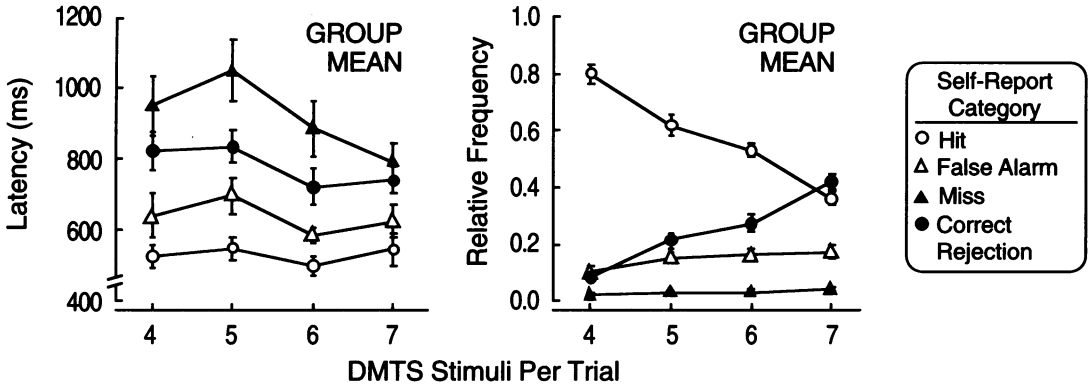

Fig. 3. Experiment 1: Mean latency, and mean frequency of occurrence, for self-reports in the four categories defined by a signal-detection analysis, as a function of the complexity of the DMTS task.

Results

Analyses incorporate 8 conditions in which all 10 subjects participated, and are based on approximately 400 trials per condition, or about 3200 latencies per subject. For simplicity of presentation I will focus primarily on group data[1].

The left panel of Figure 3 shows group-mean self-report latency as a function of DMTS difficulty (summarized here as the total number of stimuli, both samples and comparisons, presented on each trial). Range bars show ±1 standard error of the measurement. Mean latencies tended to be different for hits, misses, false alarms, and correct rejections, although this outcome must be interpreted in light of the fact that the relative frequency of occurrence (left panel of Figure 3) also differed for responses in these four self-report categories (as Critchfield, 1993a, reported). It is well-established that frequency of occurrence can influence response latencies (Luce, 1986), and this effect was evident in two plots of self-report latency as a function of frequency of occurrence. Because the overall distribution of latencies was positively skewed, log transformations were employed in Figure 4 to facilitate analyses based on linear regression. Panel A shows individual-subject condition means for the four self-report categories in each of the DMTS-difficulty conditions shown on the abscissa of Figure 3. For simplicity of presentation, neither individual subjects nor self-report categories are designated by unique symbols. Panel B shows group-mean latencies for each of the four self-report categories in each of the four stimulus conditions. Both panels show that self-report latencies tended to be longer for infrequently-occurring self-report categories than for frequently-occurring ones.

To incorporate this correlation into the analysis, a two-way analysis of covariance was conducted on the data shown in Panel A of Figure 4, with self-report category (hit, miss, false alarm, correct rejection) and DMTS difficulty as factors, and frequency of occurrence as the regressor. Only the effect of the regressor was statistically significant, $F(1) = 12.4$, $p = .0006$, indicating that the four signal-detection categories did not provide a useful basis for analyzing self-report latencies. But this does not imply an absence of interesting effects. Panel B of Figure 4 also suggests that latencies tended to be different for self-reports indicating success (open symbols; hits and false alarms) and self-reports indicating failure (filled symbols; misses and correct rejections). To aid visual inspection of the panel, least-squares linear regression was used to fit functions to these two superordinate self-report categories. The functions suggest a differentiation of latencies based on the content of the self-report, irrespective of actual DMTS performance. A second two-way analysis

[1]Condition means for individual subjects were the basis for the analyses presented here. Although this approach obscures the variability within conditions, means typically were similar to medians and thus provide a reasonable measure of central tendency.

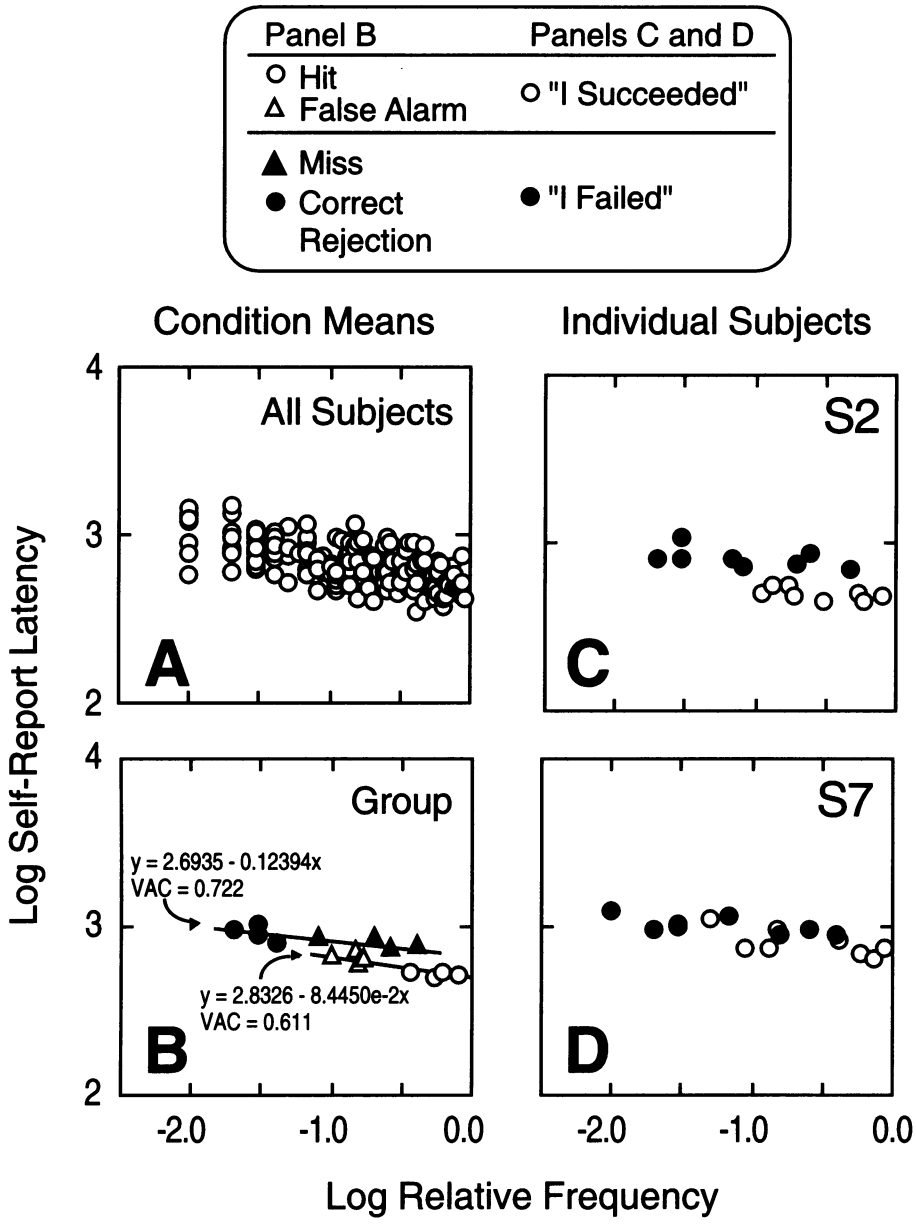

Fig. 4. Experiment 1: Log self-report latency as a function of log frequency of occurrence. See text for details.

of covariance of the data shown in Panel A tested this notion, using self-report category (now "I succeeded" versus "I failed") and DMTS difficulty as factors, and frequency of occurrence as the regressor. Even when adjusted for the significant effect of frequency [$F(1) = 33.1$, $p = .0001$], reports of failure occurred after significantly longer latencies than reports of success [$F(1) = 9.8$, $p = .0004$], for a mean log-equivalent difference of about 250 ms. The final panels of Figure 4 help to illustrate how the tendency just described was expressed in the performance of individual subjects. S2 (Panel C) was one of seven subjects for whom the evidence of the group pattern was visually discernible (my subjective appraisal). S7 (Panel D) was one of three subjects for whom no evidence of the pattern was apparent. Overall, it seems justified to conclude that subjects were slower to say "I failed" than to say "I succeeded."

Discussion

Self-report categories defined by signal-detection analysis have been found to aid in the analysis of relations between self-reports and their referents (e.g., Critchfield, 1993a). These categories did not, however, aid in the analysis of latencies of the same self-reports by the same subjects, despite superficial appearances to the contrary (left panel of Figure 3). Instead, latency was related to self-report "content" in a straightforward way: Subjects took longer to report that they had failed than to report that they had succeeded. This tendency is less robust than some other patterns I have described in self-reports (e.g., Critchfield, 1993a), but nevertheless it suggests that different analytical approaches may reveal order in different characteristics of the same verbal self-reports. From a functional perspective, this is neither startling nor unexpected, given the fluidity of verbal behavior production and the variety of factors that can influence it (Skinner, 1957).

Several alternative explanations of the present data are possible, but two procedural artifacts can be readily ruled out. First, self-report latencies were not differentiated on the basis of the physical properties of the response, because the two types of self-reports consisted of identical button presses. Second, differential self-report latencies probably did not result from features of the apparatus. Both "I failed" and "I succeeded" self-reports required moving the hands from DMTS buttons on the face of the response console to self-report buttons placed symmetrically on its sides (for details, see Critchfield, 1993a; Critchfield & Perone, 1990).

EXPERIMENT 2

To provide a relatively simple basis for evaluating report-referent correspondence, each of the self-report studies conducted in my laboratory has employed forced-response self-report procedures similar to that used in Experiment 1. That is, when asked whether the previous DMTS response has been successful, subjects had to respond "YES" or "NO" to advance the session to the next trial. This procedure constrains report and referent into trials, in which their temporal relation is relatively easy to ascertain, and also serves to limit the range of possible self-report topographies. Naturally-occurring verbal behavior, of course, is far more likely to approximate a free operant. Its topography can vary, and it may be emitted or not, depending on the prevailing conditions (Skinner, 1957). Experiment 2 was designed as a step toward examining self-reports in something more akin to a free-operant situation.

The procedures described in Experiment 1 were modified to permit self-reports to be "withheld" (not emitted) on any given trial at the subject's discretion. Subjects performed the same DMTS task and, after each trial, encountered the same query ("Did you score?"). In addition to the "YES" and "NO" buttons, subjects had an additional self-report option. This third possible response also served to advance the session, but was not designated as a specific answer to the self-report query. I will refer to these responses as *nondisclosures*. Experiment 2 sought to determine some of the conditions under which subjects opted to make a nondisclosure rather than to make a self-report.

Method

Subjects and Apparatus

Three undergraduate students participated. Just as in Experiment 1, subjects performed the DMTS task using four round, illuminable response keys arranged horizontally near the bottom of the console's sloping front panel, and made "YES" and "NO" self-reports using two pushbuttons, each mounted to a small box extending from each side of the console. In addition, nondisclosures could be made by pressing a small, metal button, flanked by two white lamps, located near the top of the subject's console.

Procedure

Each trial consisted of one DMTS response followed immediately, when

scheduled, by a self-report or feedback about the success of the DMTS response. No point consequences were contingent on the self-report. An orienting response was required to initiate each trial, thus insuring that subjects faced the computer screen prior to the appearance of experimental stimuli (see Critchfield, 1993a).

Experimental conditions. Each experimental condition lasted 8 sessions. Sessions 1 through 3 consisted solely of DMTS trials without self-reports. During Session 1, each DMTS response was followed by the outcome feedback described previously. Successful DMTS responses (those that were both correct and faster than the time limit) earned 2 points. During Sessions 2 and 3, successful DMTS responses produced points on a random-ratio 5 schedule. Reinforcer magnitude was raised to 10 points to keep overall point earnings relatively constant within an experimental condition. No feedback followed the other trials.

During sessions 4 through 8, one of two self-report procedures was added on the trials in which DMTS responses produced no feedback or points. The center of the self-report box on the subject's screen displayed the query, "Did you score?" The possible responses to this query varied across sessions. On about half of the self-report sessions of each condition (a randomly-determined two or three of the 5 possible sessions), three different responses, including nondisclosures, were possible (Figure 1, Panel E). Below the query, the labels "<–YES" and "NO–>" appeared 1 cm from the right and left sides of the self-report box, respectively. Between them appeared a label associated with the nondisclosure button ("DON'T KNOW" for S98 and "NO COMMENT" for S121 and S128). The white lights adjacent to the small metal button at the top of the console's front panel became illuminated at this time. Pressing the button attached to the console's left side registered a "YES" report, and pressing the button attached to the console's right side registered a "NO" report. Pressing the metal button on the console's front panel registered a nondisclosure. Pressing any of these buttons cleared the screen and initiated the ITI. Other buttons were ineffective.

During the condition's other self-report sessions, only the "YES" and "NO" self-report options were available, as in Experiment 1 (Figure 1, Panel D). These control sessions were included because they were essentially identical to the procedures of previous studies in my laboratory. No data will be presented for these sessions. Thus, each experimental condition produced an approximately 160 to 240 trials on which nondisclosures could occur (80% of two or three 100-trial sessions).

Each subject completed a sequence of four experimental conditions selected, based on previous research, to produce a range of DMTS success rates. For S98, the sequence was, in the nomenclature introduced in the General Methods, 33, 22, 44, and 13. For S121 and S128, the sequence was 32, 13, 22, and 12.

Preliminary training. Before starting the experiment, subjects read the printed instructions reproduced in Appendix A. An 8-session preliminary training phase was used to familiarize subjects with the DMTS task. No self-reports occurred. To acquaint subjects with a variety of possible stimulus configurations, trials involved either (a) one sample stimulus and four comparison stimuli; or two sample stimuli and three comparison stimuli. The two types of trials were intermingled within sessions. Stimuli consisted of alphanumeric characters during Session 1 and the geometric shapes described in the General Methods during subsequent sessions. During Sessions 1 through 4, feedback followed every DMTS trial (2 points per reinforcer). During sessions 5 through 8, successful DMTS responses produced points on a random-ratio 5 schedule (10 points per reinforcer).

Results and Discussion

In Figure 5, bars show the proportion of DMTS responses that were successful during each experimental condition. The experimental conditions produced a variety of DMTS success rates. The figure also shows the proportion of self-report trials

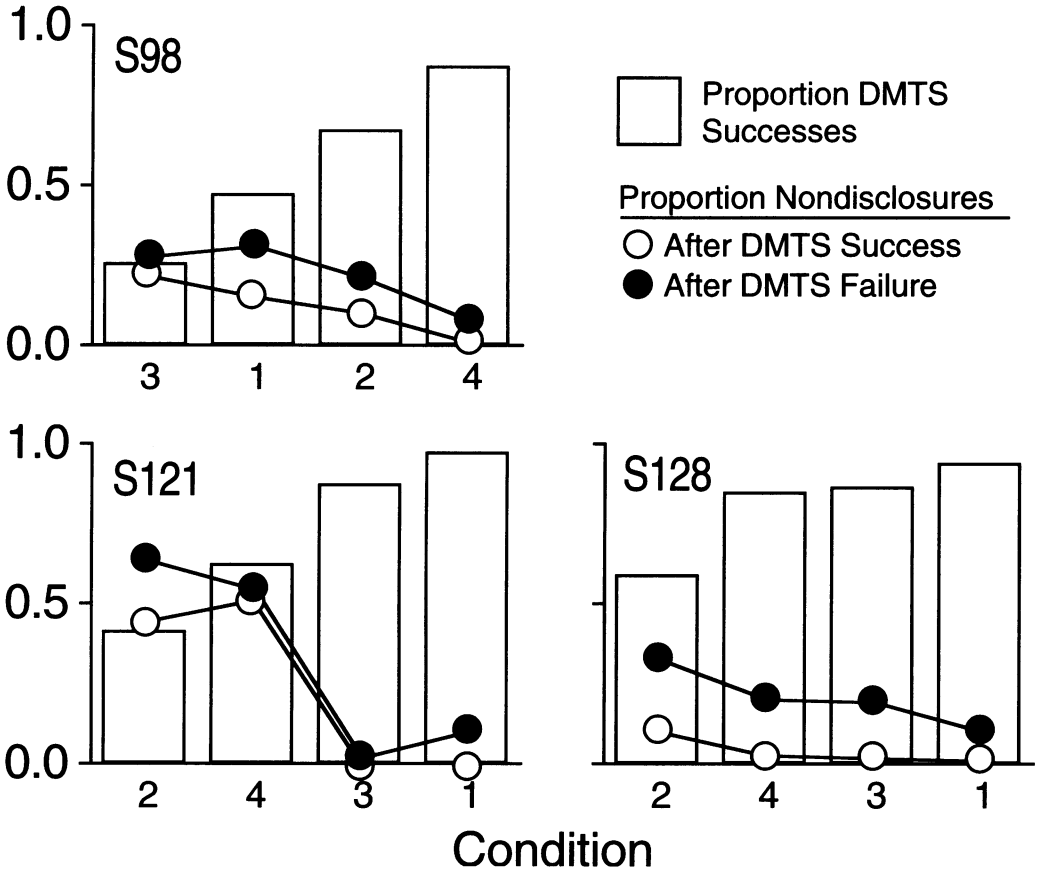

Fig. 5. Experiment 2: Proportion of nondisclosures, and proportion successful DMTS responses, in each of the DMTS difficulty conditions.

on which subjects made a nondisclosure. Overall, nondisclosure rates were negatively correlated with DMTS success rates. Most importantly, in all conditions for all three subjects, nondisclosures were more common, per opportunity, following unsuccessful DMTS responses (filled circles) than following successful ones (open circles).

Nevertheless, it is probably safest to assume that nondisclosures were multiply determined, for two reasons. First, the negative correlation between nondisclosure rates and DMTS success rates remains to be explained. Second, nondisclosures sometimes occurred after DMTS successes, and it is unclear whether an operant account predicts aversive properties of saying, "I succeeded." Alternative sources of control are easily imagined. For example, on some occasions, nondisclosures may have reflected true uncertainty about the success of the preceding DMTS response.

Primarily to assess the generality of effects reported in Experiment 1, Figure 6 shows self-report latencies for "I succeeded" (filled circles) and "I failed" (filled triangles) self-reports. The large number of conditions and subjects in Experiment 1 precluded a data presentation format incorporating the variability of individual-subject latencies. Data are therefore shown in an alternative format here. For each subject, self-report latencies from all conditions were combined and arranged in ascending sequence. Latencies then were determined for percentile ranks ranging from 10 to 90 in intervals of 10. For all three subjects, latencies tended to be longer for reports of failure than for reports of success, replicating the effect observed in Experiment 1.

Because analogous data have not been reported elsewhere, the same analysis was conducted for latencies of nondisclosures, although not to address specific predictions from Skinner's (1957) conceptual analysis. Separate symbols in Figure 6 represent nondisclosures that occurred following DMTS successes (open circles) and failures (open triangles). Latencies were much alike in the two cases. Overall, latencies for nondisclosures tended to be more similar to those of "I failed" self-reports than to those of "I succeeded" self-reports. The implications of, and basis for, this tendency remain to be explored.

In lay terms, the dependent variable of Experiment 2 might be described as "not responding." In this regard, it may be worth noting that persons completing surveys often fail to answer all questions, creating concern among survey researchers about whether omissions are random or part of a systematic pattern that could bias the results. Apparently little is known about the variables with which omissions are associated (e.g., Durand, Guffey, & Planchon, 1983; Johanson, Gips, & Rich, 1993), but at least one effect has been reported that is reminiscent of a pattern shown in Figure 5. Supervisors of student teachers completed multiple-item performance ratings on which each item contained a "Don't Know" option. Rates of "Don't Know" responses were negatively correlated with the overall favorability of the evaluation (Johanson, et al., 1993). The present procedures may provide a well-controlled assay in which analogous patterns could be investigated.

GENERAL DISCUSSION

Previous studies from my laboratory have shown that the correspondence between self-reports and their presumed referents varies predictably with environmental circumstances, including the frequency with which the referent occurs (Critchfield, 1993a, 1994); characteristics of, or contingencies upon, the referent behavior (Critchfield, 1993a, 1994; in press; Lane & Critchfield, 1996); and the physiological state of the individual making the self-

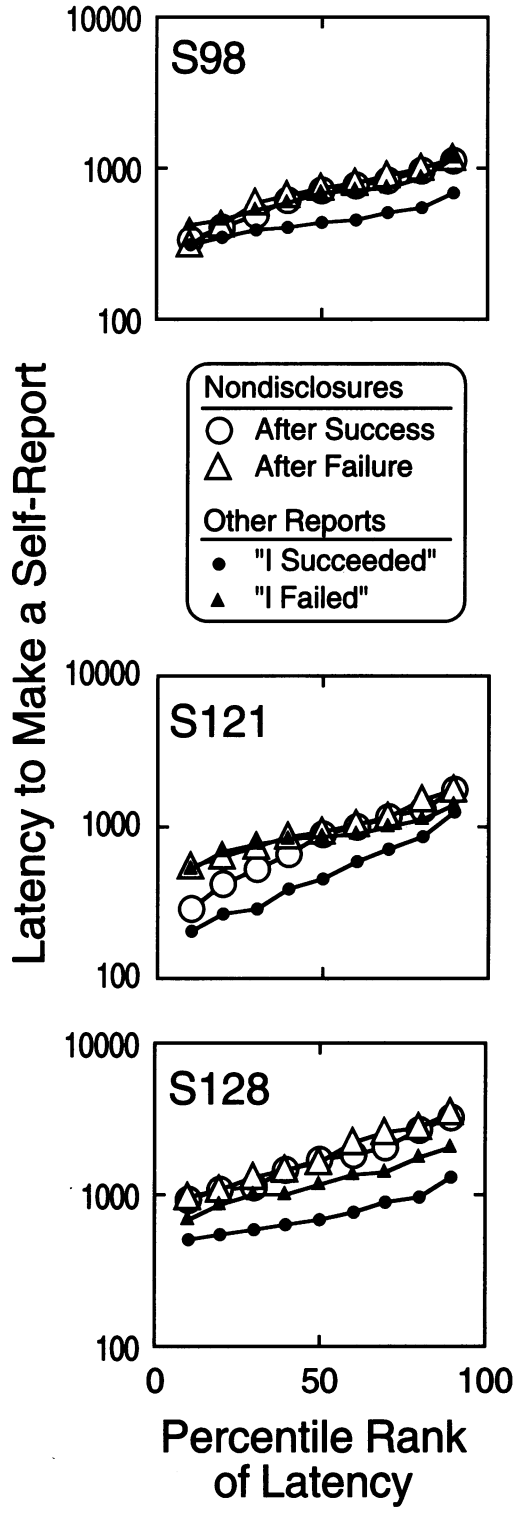

Fig. 6. Experiment 2: Latencies of self-reports and nondisclosures in class intervals defined according to percentile ranks within the distribution of latencies for each latency function.

report (Critchfield, 1993b). The present data suggest that the procedures employed in these studies can also be useful in the analysis of other properties of self-reports.

Two effects were described. First, Experiment 1 showed that "I failed" self-reports tended to be emitted after longer latencies than "I succeeded" self-reports. Second, Experiment 2 showed that subjects sometimes took advantage of an opportunity to avoid making self-reports, and did so more often after they had failed than after they had succeeded on the DMTS task about which they were asked to make reports. Interestingly, both of these effects are reminiscent of the characteristics of punished behavior, as described both in basic research on nonverbal behavior and in Skinner's (1957) conceptual analysis of verbal behavior.

Basic research shows that reinforcement decreases response latencies and mild punishment may increase response latencies (e.g., Luce, 1986), even when consequences are not explicitly contingent upon latency. Consequently, Skinner (1957) assumed that "strong verbal behavior is rapid" (p. 24) and "punished [verbal] behavior may...be emitted slowly or hesitantly. This is not the slowness of weak behavior resulting, say, from inadequate conditioning or unclear stimuli" (p. 168). Punishment also decreases frequency of occurrence, often resulting in a re-allocation of effort to alternative responses (Azrin & Holz, 1966; Skinner, 1957).

To propose that patterns observed in the present studies reflect a history of differential punishment is to promote assumptions about the modal practices of the verbal commmunity that cannot be addressed by the present data. One crucial assumption is that verbal communities often place self-reports and their presumed referents into a single response class, in the sense that self-reports may produce the same consequences as the acts they describe. This happens especially when verbal communities value information that may be most readily available through self-reports. In such cases, if an act merits praise, then self-reports of that act also will generate praise occasionally (for example, parents in the United States tend to react favorably to positive self-statements by young children; see Markus & Kitayama, 1991). If an act merits scorn or reprimand, then self-reports of that act can generate similar consequences, a rough equivalent to "killing the messenger." This combination of events should leave uncomplimentary self-descriptions weaker than complimentary self-descriptions, and the difference should be observable in terms of latencies and frequencies of emission. A possible manifestation of the above can be found in the pervasive "self-enhancement bias" described in many fields that rely heavily on self-report data (e.g., Critchfield, 1993a, 1994; Taylor & Brown, 1988). Generally speaking, individuals tend to over-report socially-desirable actions and attributes, and under-report socially-undesirable ones.

The pattern of selective nondisclosures observed in Experiment 2, in which subjects chose *not* to make a self-report more often after failing than after succeeding, provides the basis for a different type of speculation. One way of construing this pattern is that, by reporting "No comment" or "I don't know," subjects acted to terminate situations in which the most probable response was to say, "I failed," thus meeting the definition of avoidance (e.g., Catania, 1992). Skinner (1953, 1957) assumed that, through repeated pairing with social consequences, verbal responses can themselves acquire conditioned ("automatic") reinforcing or punishing properties (see Vaughn & Michael, 1982). This was held to be possible because "speakers" can simultaneously function as "listeners" for their own verbal responses, and because, in a presumably Pavlovian process, physical characteristics of those verbal responses, as reliable predictors of social consequences, can begin to affect the individual in ways similar to the social consequences. As Skinner has noted:

> If a given response is followed by an aversive stimulus, any stimulation which accompanies the response, whether it arises from the behavior itself or from concurrent circumstances, will be conditioned....Any behavior which reduces

> this conditioned aversive stimulation will be reinforced.... The most important effect of punishment, then, is to establish conditions which are avoided by any behavior of "doing something else" (Skinner, 1953, pp. 188-189)

Given an historical pattern of pairing uncomplimentary self-reports with punishment, the response products associated with such reports could acquire conditioned aversive properties. Such aversive stimulation could then be produced automatically under circumstances in which normal stimulus control makes an "I failed" response probable. By pressing a "Don't know" or "No comment" button, subjects may have "done something else" in a more socially-acceptable fashion than explicitly lying (an act that itself could generate conditioned aversive stimuli; see Skinner, 1957)[2].

Is it aversive to say, "I failed"? The answer to that question awaits additional research. One useful approach would be to explore the limits of selective nondisclosure and related verbal biases as they naturally occur. For example, in the present study, each condition lasted only about two hours. Would the pattern of selective nondisclosure following failure remain after many additional hours of measurement? A second, and more important, approach would be to determine whether experimentally-arranged consequences can produce effects like those observed here, thus permitting a more thorough experimental analysis than was possible in the present investigation.

The present discussion of punishment histories and automatic consequences far exceeds the scope of the data reported here, but there are two compelling reasons to speculate.[3] The first is that raising difficult empirical questions may promote advances in the methods employed to examine some of the basic tenets of Skinner's (1957) conceptual analysis of verbal behavior. Although *Verbal Behavior* has been widely cited (Knapp, 1992; McPherson, et al. 1984), it has not spawned a great deal of research (e.g., Hake, 1982; Oah & Dickinson, 1989; Dougherty, 1994; McPherson, et al., 1984; Sundberg, 1991). Part of the difficulty may lie in the tradition in the experimental analysis of behavior of establishing and manipulating behavioral repertoires that are relatively free of pre-experimental influences. From this perspective, the most capable and available subjects – normal adults – may be unsuitable for study because of their extensive, uncontrolled histories (e.g., see Branch, 1991). Answering questions of the sort raised here may require a broader array of methods, including descriptive studies of naturally occuring verbal practices (e.g., see Moerk, 1990) and creative experimental approaches to teasing apart the influences on existing verbal behavior.

A second reason for exploring the relevance of the present data to Skinner's (1957) analysis of verbal behavior is that the analysis bears on phenomena of interest to other psychologists (e.g., see Vaughan & Michael, 1982), making its empirical validity of special interest. Consider again the issue of biases in verbal reports. The pervasiveness of "self-enhancement" has led to dispositional hypotheses that view it as intrinsic to the human organism and a cornerstone of good mental health (e.g., Bjorkland & Green, 1992; Sackeim, 1983; Taylor & Brown, 1988). By contrast, many interview researchers acknowledge the possibility of momentary distortion in self-report by the "level of threat" of the interview and the "sensitivity" or "anxiety-arousing" nature of the topic (e.g., Johansen, et al., 1993; Sudman & Bradburn, 1974; Wentland & Smith, 1993), but fail to clearly delineate

[2]Although a history of punishment is the most likely source of conditioned aversive properties, another explanation is possible. Studies with nonhumans suggest that stimuli correlated with extinction can be aversive (e.g., Dinsmoor, 1983). The jury is still out on the generality of these affects to humans (e.g., see the commentaries published along with Dinsmoor, 1983).

[3]Any speculation must be undertaken within two constraints. The first is the question of whether automatic consequence effects could ever be unambiguously ascertained. Automatic consequences are supposed to produce effects in the same direction as the history of social consequences that produced them, making it difficult to determine what proportion of variance might come from either source. The second is that the present data are purely descriptive and include no measure of pre-experimental histories.

the factors that cause self-disclosure to become threatening, sensitive, or anxiety-arousing. Skinner's (1953, 1957) discussion of tact repertoires and self-description suggests a basis for self-enhancement in response biases promoted by a combination of local social contingencies and automatic consequences resulting from historical social consequences. In this view, self-descriptive biases should be both situational and "dispositional" (in the sense of pervasive rather than phylogenic) – and should be easily reconcilable with fundamental principles generated from the study of many other types of behavior.

Unambiguous data on the mechanisms underlying verbal biases could place operant psychology at the center of some prominent discussions in psychology. The scope of the opportunity is illustrated by the impact of Taylor and Brown's (1988) dispositional theory of self-enhancement, which was cited more than 250 times in only the first four years after its publication (Colvin & Block, 1994). Although not all citations are complimentary, citation rate does provide a measure of influence, and behavior analysts have long sought broader influence in psychology. A thoroughgoing empirical analysis of commonly-occurring verbal tendencies could provide one basis for introducing new audiences to the fruits of operant research and the conceptual advantages of Skinner's (1957) approach to verbal behavior.

REFERENCES

Andresen, J. (1991). Skinner and Chomsky 30 years later or: The return of the repressed. *The Behavior Analyst, 14*, 49-60.

Azrin, N. H., & Holz, W. C. (1966). Punishment. In W. K. Honig (Ed.), *Operant behavior: Areas of research and application* (pp. 380-447). New York: Appleton-Century-Crofts.

Baron, A., & Menich, S. R. (1985). Reaction times of older and younger men: Effects of compound samples and a prechoice signal on delayed matching-to-sample performances. *Journal of the Experimental Analysis of Behavior, 44*, 1-14.

Bjorkland, D. F., & Green, B. L. (1992). The adaptive nature of cognitive immaturity. *American Psychologist, 47*, 46-54.

Branch, M. N. (1991). On the difficulty of studying "basic" behavioral processes in humans. *The Behavior Analyst, 14*, 107-110.

Catania, A. C. (1992). *Learning* (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Colvin, C. R., & Block, J. (1994). Do positive illusions foster mental health? An examination of the Taylor and Brown formulation. *Psychological Bulletin, 116*, 3-20.

Craig, A. (1979). Vigilance for two kinds of signals with unequal probabilities of occurrence. *Human Factors, 21*, 647-653.

Critchfield, T. S. (1993a). Signal-detection properties of verbal self-reports. *Journal of the Experimental Analysis of Behavior, 60*, 495-514.

Critchfield, T. S. (1993b). Behavioral pharmacology and verbal behavior: Diazepam effects on verbal self-reports. *The Analysis of Verbal Behavior, 11*, 43-54.

Critchfield, T. S. (1994). Bias in self-evaluation: Signal-probability effects. *Journal of the Experimental Analysis of Behavior, 62*, 235-250.

Critchfield, T. S. (1996). Verbal self-reports about performance under time pressure: Bias and discriminability. *Psychological Record, 46*, 333-350.

Critchfield, T. S., & Perone, M. (1990). Verbal self-reports of delayed matching to sample by humans. *Journal of the Experimental Analysis of Behavior, 53*, 321-344.

Critchfield, T. S., & Perone, M. (1993). Verbal self-reports about matching to sample: Effects of the number of elements in a compound sample stimulus. *Journal of the Experimental Analysis of Behavior, 59*, 193-214.

Dinsmoor, J. A. (1983). Observing and conditioned reinforcement. *Behavioral and Brain Sciences, 6*, 693-728 (includes commentary).

Dougherty, D. M. (1994). The *selective* renaissance of the experimental analysis of human behavior. *The Behavior Analyst, 17*, 169-174.

Durand, R. M., Guffey, H. J., & Planchon, J. M. (1983). An investigation of the random versus nonrandom nature of item omission. *Journal of Marketing Research, 20*, 305-315.

Green, D. M., & Swets, J. A. (1966). *Signal detection theory and psychophysics*. New York: Wiley.

Hake, D. F. (1982). The basic-applied continuum and the possible evolution of human operant social and verbal research. *The Behavior Analyst, 5*, 21-28.

Holz, W. C., & Azrin, N. H. (1966). Conditioning human verbal behavior. In W. K. Honig (Ed.), *Operant behavior: Areas of research and application* (pp. 790-826). New York: Appleton-Century-Crofts.

Johansen, G. A., Gips, C. J., & Rich, C. E. (1993). "If you can't say something nice." A variation on the social desirability response set. *Evaluation Quarterly, 17*, 116-122.

Knapp, T. J. (1992). *Verbal Behavior*: The other reviews. *The Analysis of Verbal Behavior, 10*, 87-95.

Lane, S. D., & Critchfield, T. S. (1996). Verbal self-reports about emergent relations in a stimulus equivalence procedure. *Journal of the Experimental Analysis of Behavior, 65*, 355-374.

Lieberman, D. A. (1975). Behaviorism and the mind: A (limited) call for a return to introspection. *American Psychologist, 34*, 319-333.

Luce, R. D. (1986). *Response times: Their role in inferring elementary mental organization*. New York: Oxford University Press.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Bulletin, 98*, 224-253.

McCarthy, D., & Davison, M. (1981). Towards a behavioral theory of bias in signal detection. *Percetion & Psychophysics, 29*, 371-382.

McPherson, A., Bonem, M., Green, G., & Osborne, J. (1984). A citation analysis of the influence on research of Skinner's *Verbal Behavior. The Behavior Analyst, 7,* 157-167.

Moerk, E. L. (1990). Three-term contingency patterns in mother-child verbal interactions during first-language interaction. *Journal of the Experimental Analysis of Behavior, 54,* 293-305.

Oah, S., & Dickinson, A. M. (1989). A review of empirical studies of verbal behavior. *The Analysis of Verbal Behavior, 7,* 53-68.

Sackeim, H. A. (1983). Self-deception, self-esteem, and depression: The adaptive value of lying to oneself. In J. Masling (Ed.), *Empirical studies of psychoanalytic theories* (Vol. 1, pp. 101-157). Hillsdale, NJ: Analytic Press.

Salzinger, K., & Salzinger, S. (Eds.) (1967). *Research in verbal behavior and some neuropsychological implications.* New York: Academic Press.

Skinner, B. F. (1953). *Science and human behavior.* New York: Free Press.

Skinner, B. F. (1957). *Verbal behavior.* New York: Appleton-Century-Crofts.

Sudman, S., & Bradburn, N. M. (1974). *Response effects in surveys: A review and synthesis.* Chicado: Aldine.

Sundberg, M. L. (1991). 301 research topics from Skinner's book *Verbal Behavior. The Analysis of Verbal Behavior, 9,* 81-96.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social-psychological perspective. *Psychological Bulletin, 103,* 193-210.

Vaughan, M. E., & Michael, J. (1982). Automatic reinforcement: An important but ignored concept. *Behaviorism, 10,* 217-227.

Wentland, E. J., & Smith, K. W. (1993). *Survey responses: An evaluation of their validity.* San Diego: Academic Press.

APPENDIX A

Instructions Read Before the First Session

In front of you is a console containing several lights and buttons. Your job is to make decisions based on information presented on your screen, and to indicate your decisions using buttons on the console. When you depress the lighted round buttons, one or more "sample" shapes will appear briefly for you to study, then disappear. Shortly afterward, some "test" shapes will appear. Your job is to decide which one of these test shapes matches one of the samples. You can indicate your decision by releasing the lighted button corresponding to the matching shape (note that there are four positions on your screen, and four lighted buttons). Note that you must hold down the lighted buttons until you are ready to indicate your decision. If you release too soon, the trial will cancel and start again, wasting time in which you could be earning points. You can earn points each time you choose the correct (matching) test shape. In order to earn a point, your choice must be both correct and within a time limit. The time limit will not change after your first work day. To begin with, after each complete trial, messages on your screen will tell you whether you earned points. Later on, you may be given less or different information about your decisions. Your screen will give you new instructions if the way you earn points should change. Do not attempt to ask questions or leave the room until the work period is over. Beyond the information contained in these instructions, it is up to you to decide how to operate the console to your best advantage. This is all the information we can provide at this time. If you have any questions, please ask them now.