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EFFECTS OF COMPETITIVE REWARD DISTRIBUTION ON AUDITING AND COMPETITIVE RESPONDING

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This study allowed subjects to audit each other's responding during a series of competitive contests. Six pairs of female college students competed in 3-min contests in which the competitive response was a knob pull. A sum of money was divided using a proportional distribution or a 100%/0% reward distribution. In the proportional distribution, a subject's proportion of the sum was her proportion of the total number of responses. Also, in every contest either subject could make a response that would end the contest prematurely and give both subjects the same amount: a sum equal to 33% of the competitive total. Each subject could press either or both of two audit buttons that displayed her own and the other's response total for 10 s. Results replicated earlier findings in showing the superiority of the proportional distribution in total number of competitive responses made. No subject audited continuously, and only 1 audited most of the time. Most audits were interpersonal, including both own and other's scores. Auditing typically was more frequent in 100%/0% contests in which subjects were more likely to stop the contest when they were far behind. Winners were more likely to audit than were losers. Competitive response rates increased when the differences revealed by audits were small and decreased when they were large. Overall audit patterns were consistent with the view that feedback as ''news'' is more often sought when it can lead to improved outcomes.

Key words: competition, auditing, reinforcement contingencies, reward distributions, performance feedback, knob pulls, college students

Competitive reward contingencies are ubiquitous in education, business, and sports in motivating performances of participants in a group. With competitive contingencies, rewards are distributed unequally based on relative performance. Competitive contingencies are frequently compared with cooperative or individual contingencies as alternative reward structures. When the object is to choose the reward structure that produces the best total effort by the group (e.g., problems solved, products produced), results from a large body of research reveal cooperation to be more often superior when the comparison involves a range of task types (for reviews, see Johnson, Maruyama, Johnson, Nelson, & Skon, 1981; Qin, Johnson, & Johnson, 1995; Rosenbaum, 1980; Schmitt, 1981; Slavin, 1983; Stanne, Johnson, & Johnson, 1999). A key to this superiority is that many tasks entail means interdependence, in which the product needed for reward is greatly facilitated by (or even requires) a sharing of information or a division of labor. Such responses are likely with cooperative contingencies but are unlikely with competitive ones, where they may give greater advantage to a competitor than to oneself. Consequently, competition is effective only when task responses can be made independently by each person, with little or no collaboration. Under appropriate task conditions, competition can be as productive as cooperation (Stanne et al., 1999), can be more cost effective (Schmitt, 1987), and is often easier to implement in everyday settings. Schmitt (1987) also found that competitive performance was enhanced when competitors could not easily withdraw from the task and when competitive and individual contingencies were combined. Overall, however, few studies have explored conditions that determine the effectiveness of competition (Schmitt, 1986, 1998; Stanne et al., 1999).

Recently, Schmitt (1998) developed a 2-subject laboratory setting to explore two major variables that are necessarily present in any competition: reward distribution and performance feedback. Three reward distributions, two fixed and one proportional, were compared. The two fixed distributions divided the total contest reward 100%/0% and 67%/33%. With the proportional distribution, each person's proportion of the total

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contest reward equaled that person's contribution to the total group output. The pairs competed over a series of 2-min contests in which the competitive response was a knob pull. A sum of money was divided at the end of each contest. In every contest either subject could also make a response that would end the contest prematurely and give both subjects the same amount, equal to 33% of the total. Type of reward distribution had a major effect on responding. The proportional distribution was superior to either of the fixed distributions in number of total responses, with fixed distributions often producing decelerating response rates. The 100%/0% distribution produced the fewest responses. Contests also differed in the presence or absence of performance feedback. Because performance information is correlated with the likelihood of reinforcement, it seems probable that there are occasions on which it will function as a discriminative stimulus to increase or decrease a competitor's responding. In the feedback condition, computer screens continuously displayed cumulative pulls by each subject during the entire contest. In the no-feedback condition they did not, although the number of pulls were shown at the end of each contest. Performance feedback had only a small effect overall, increasing responding for some pairs in the 100%/0% distribution. Possible reasons for the small effect included the short contest lengths and a procedure that alternated feedback and no-feedback conditions across the series of contests, thus providing competitors a rapid accumulation of information.

Schmitt's (1998) feedback and no-feedback conditions represent two of several feedback possibilities. First, feedback can be given intermittently instead of continuously in a variety of predictable or unpredictable patterns. Second, feedback can be made available at the experimenter's discretion (as in Schmitt's study), or it can depend on a response made by the subject. With the latter option, whether or not subjects seek (and presumably view) the feedback can be ascertained, and a cost could also be added for that observation. The present study investigated the use of subject-initiated feedback in the previously developed competitive context.

Hake, Vukelich, and Kaplan (1973) were the first to investigate subject-initiated feedback responses (termed audit responses) using a 2-subject laboratory task. The audit response was a button press that briefly illuminated a counter on the subject's own panel. An audit that gave access to one's own score was termed a *self-audit,* and one that gave access to the partner's score was termed a *coactor audit*. Self- and coactor audits that occurred within a brief period were termed *interpersonal audits* because they suggested a comparison of scores. The context studied was one in which 2 subjects could most efficiently solve individual problems with assistance from the other, which is an exchange setting rather than a competition (Schmitt, 1998). Hake et al. (1973) found that adding a 2nd subject to the setting led to coactor audits and an increase in self-audits. Vukelich and Hake (1974) found that subjects made interpersonal audits more frequently when their scores were even, as opposed to ahead or behind. Hake and Olvera (1978) suggested that the audit option should increase the likelihood of exchange by allowing subjects to adjust their responding to achieve an equitable exchange.

Buskist and Morgan (1988) summarized two studies of auditing in which 2 subjects competed to complete various fixed-ratio or variable-ratio reinforcement schedules. Each audit response consisted of five responses on a lever, and provided information concerning the other's score (coactor audits). In both studies, auditing was more frequent when scores were similar than when large discrepancies developed, consistent with Vukelich and Hake's (1974) findings. In the second study, they also found auditing by subjects who were behind during competition, but not by ones who were far ahead.

Audits are examples of observing responses in which information pertaining to the likelihood of reinforcement is revealed. Studies of observing responses in various contexts have classified the information as "good news," "bad news," or "no news" as it relates to forthcoming reinforcement. Two different perspectives make contrasting predictions for these responses (Fantino, 1998a, 1998b). The information processing hypothesis asserts that informative stimuli are reinforcers, and thus good news and bad news should be preferred to no news. The conditioned reinforcement hypothesis asserts that only stimuli correlated with positive reinforcement become reinforcers, and thus only good news should be preferred to no news, which in turn should be preferred to bad news. Studies by Fantino and his associates (summarized in Fantino, 1998a, 1998b) support the conditioned reinforcement hypothesis, with the proviso that bad news may be sought when it can be used in some positive way later, evidence that others have interpreted as supporting the information processing hypothesis (Lieberman, Cathro, Nichol, & Watson, 1997). In the context of competition, these findings seem to predict auditing for both competitors in close contests, in which the probability of winning remains at least moderate, and also by the subject ahead in contests no longer close, in which audits would reveal only good news.

To investigate more fully the frequency and effects of both self- and coactor audits under competition, the present study investigated auditing in a setting similar to the one used by Schmitt (1998), in which the subject making the largest number of responses in a fixed time period won. Unlike the earlier study, subjects were given the opportunity to make self- and coactor audits in contests consisting of reward distributions that Schmitt found to have the most extreme effects: proportional and 100%/0%. To provide more occasions to make audit responses, contests were lengthened to 3 min. Subjects worked in 12 contests in each of three sessions, with reward distributions alternated across contests. A total of 18 contests and 54 min of competition were thus scheduled under each distribution. These exposure amounts for each condition are longer than those in Schmitt's earlier study in which subjects were scheduled for a total of 15 contests and 30 min under each condition (distributed over five sessions). In that study stable response patterns were usually evident during the final five contests. In sum, the present setting provided the opportunity to observe the frequency, patterning, and effects of self- and coactor audits under distributions with different effects on competitive responding.

METHOD

Subjects

Twelve female college students were recruited to participate in a laboratory study through notices read in undergraduate classes. The notice stated that the study would consist of three 1-hr sessions, and that subjects would earn \$9 to \$10 each session. Subjects signed consent forms agreeing to be available for the required sessions. Forms stated that contest earnings would be paid after each session, and that an extra \$4 each day would be paid after the last session.

Apparatus

Each of the two experimental rooms contained a table with a monochrome video monitor and a panel (24 cm by 43 cm) with stimulus lights, a button for ending the contest, and two audit buttons for showing one's own and the other's pulls. A plunger with a return spring (Lindsley knob) mounted below the panel required a pull of approximately 600 g (5.88 N). Instructions and point amounts were displayed on the monitor. A red light in the upper right corner of the panel (labeled "Panel On") was lighted when a contest was in effect. When a subject pulled the knob, a light in the center of the panel was illuminated for 0.1 s. The button used to end a contest, labeled "Stop Contest," was located in the lower left corner of the panel. The two audit buttons were located at the bottom of the panel. Pressing the black button on the left, labeled "Your Pulls," showed the subject the total number of her own pulls at that point in the contest, and pressing the red button on the right, labeled "Other's Pulls," showed the subject the number of pulls by the other subject. An amber light above the "Stop Contest" button, labeled "Competition On," was illuminated during a contest unless the contest was stopped by a subject. Contingencies for the 2 subjects were controlled by a computer in an adjacent room.

Procedure

Subjects reported to separate waiting areas and were dismissed separately in order to avoid contact during the experiment. Each of the three sessions consisted of 12 3-min contests. In each session, contests with proportional and 100%/0% distributions were alternated. The first contest in each session used the proportional distribution. At the beginning of the first session, the following instructions for the proportional distribution were displayed on each subject's screen:

> Amount in this contest: 150 cents. Division is based on % of total pulls made by each person. If you stop this contest, you each get 50 cents. Press buttons if you want to see pulls.

The experimenter then read the following instructions separately to each subject:

> You will be competing with another person. There will be a series of contests each lasting 180 s—3 min. The amount that can be won in each contest is shown on the screen [experimenter pointed to amount]. The person who pulls the knob the highest number of times during a contest wins the most money. How the money is divided is shown on the screen [experimenter pointed to statement of amount on the screen]. This means that if you pull 200 times and the other person pulls 100 times, you will get twice as much as the other person—100 cents versus 50 cents. Once the contest begins, you can end it at any time by pressing the red button. The competition light will go out and you must wait until the contest ends—a total of 180 s. Then each of you will get 50 cents [experimenter pointed to statement of amount on the screen]. Press these buttons [experimenter pointed to audit buttons] if you want to see how may pulls you and the other person are making during the contest. You can press one or both buttons every 10 s to get the pull information. The black button shows your pulls and the red button shows the other person's pulls. Now you will get various conditions until the end of the session.

When the contest was started, three ongoing messages were displayed simultaneously on the computer screen. The first stated, "Contest in progress. Based on % of total pulls." The second stated, "Time remaining —" and counted down from 180 s in 10-s intervals. The third stated, "Press buttons to see pulls." If the own and other's audit buttons were each pressed once, one's own and the other's total pulls were displayed on the screen. Pulls were shown at the beginning of the next 10-s interval and remained on the screen for the duration of that 10-s interval. Additional presses before the information was displayed had no effect. If only one audit button was pressed, only the information produced by that response was shown. Only the subject who pressed a button saw the information. For information to be displayed the maximum amount of time (170 s of the 180-s contest), a subject had to press both buttons during the first 10 s of a contest and again during each of the next 16 intervals.

At the conclusion of the contest, the "panel on" light went off. If neither subject had stopped the contest and at least 1 subject had made a pull, 150 cents were divided between the subjects, based on proportion of total pulls. A message on the screen stated the number of pulls by each subject, percentage of total pulls by each subject, and each subject's earnings from that contest. It remained on the screen for 20 s, followed by the message initiating the next contest. If neither subject pulled, no earnings were received. If either or both subjects stopped the contest, a message on the screen instructed each subject to pull the knob once. Pulling the knob registered 50 cents on each subject's screen.

For contests with a fixed distribution, the message before the contest stated "Winner gets 100%. Loser gets nothing." As with the proportional distribution, screen messages during the contest stated the distribution in effect, time remaining in the contest, and that pressing the buttons showed number of pulls. Either subject could end the contest at any time by pressing the "stop contest" button. If contests with a fixed distribution ended in a tie regarding number of pulls, 1 subject was programmed as the winner. The other subject won in the case of a second tie (no ties occurred under fixed distributions). Following each block of two contests (which included the two distributions), the screen went blank for 30 s before the message initiating the next contest appeared.

At the conclusion of the experiment (after Session 3) subjects answered written questions. They were asked if they knew their partner or talked to her, if they made any agreements on how to compete, and if they let their partner win at any time. They were also asked which one of the two conditions they preferred ("Assume that you will be working under *one* condition in a future session"), and the reason for the choice. Finally they were asked if they used the buttons to see the number of pulls. If they answered "yes," they were asked how they used the buttons. If they answered "no," they were asked why they did not use the buttons.

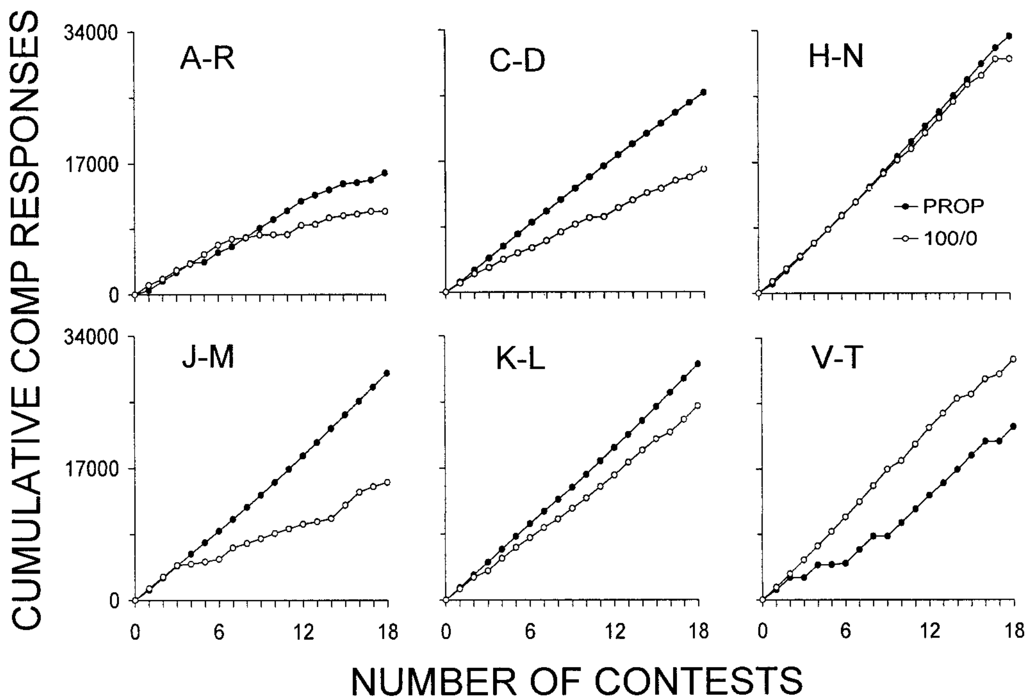

Fig. 1. Cumulative competitive responses by pair over all contests with proportional and 100%/0% reward distributions.

RESULTS

The effects of reward distribution on responding replicate Schmitt's (1998) findings in showing the superiority of the proportional distribution in total number of competitive responses made. Figure 1 shows cumulative competitive responses for the six pairs of subjects for 18 contests conducted under each of the two distributions. The cumulative responses shown for each pair in Figure 1 combine the pulls of both subjects during the contests. If one of the subjects stopped a contest, further pulls by either subject were not counted. For each pair, the cumulative responses under a given condition tended to be linear or decelerating.

Table 1 shows total number of competitive responses for each condition. For five of the six pairs, one of the proportional distributions produced 10%, 22%, 46%, 62%, and 92% more competitive responses than occurred with a 100%/0% distribution. For the remaining pair (V–T), the 100%/0% distribution produced 39% more responses than did the proportional distribution. Table 1 shows the proportion of contests completed for each distribution and the proportion of time completed in the contests that were stopped. These data show that the reduced competitive responding with the 100%/0% distribution resulted from the substantial proportion of contests that were stopped, and the fact that most contests were stopped well before they were scheduled to end. Contests were stopped by subjects who were behind. A 2 (Reward Distribution) × 18 (Contests) repeated measures analysis of variance showed a significant main effect of reward distribution, $F(1, 180) = 11.81$, $p < .001$. The Reward Distribution × Contests interaction was not significant.

Subjects varied considerably in the frequency of audit responses. For most subjects, the audit responses in each interval were interpersonal audits, in which both self- and coactor audit responses were made. For 10 of the 12 subjects, interpersonal audits ranged from 86% to 100% of all audits in the two reward distributions. For 2 subjects (1 each in C–D and J–M), self-audits were emitted more frequently (54% and 96%, respectively) with the proportional distribution.

Table 1

Total competitive responses, proportion of contests completed, proportion of contest time completed in contests that were stopped, proportion of completed contests won by the 2 subjects (A and B), proportion of competitive responses by winning subject (win proportion A or B) in completed contests, and earnings from completed contests (comp. earnings) for each subject (A and B).

Pair	Distribution	Comp. responses	Prop. contests completed	Prop. time in contests stopped	Prop. wins		Win proportion	Comp. earnings	
					A	B		A	B
A–R	Prop.	15,789	.56	.59	.10	.90	.54 (B)	6.90	8.10
	100/0	10,803	.22	.52	.00	1.00	.58 (B)	0.00	6.00
C–D	Prop.	25,850	1.00		.00	1.00	.62 (B)	10.22	16.78
	100/0	15,926	.44	.69	.00	1.00	.52 (B)	0.00	12.00
H–N	Prop.	33,265	1.00		.94	.06	.52 (A)	14.12	12.88
	100/0	30,325	.78	.38	.93	.07	.53 (A)	21.00	1.50
J–M	Prop.	29,217	1.00		.94	.06	.51 (A)	14.22	12.78
	100/0	15,158	.22	.38	1.00	.00	.52 (A)	6.00	0.00
K–L	Prop.	30,329	1.00		.22	.78	.51 (B)	13.30	13.70
	100/0	24,941	.28	.86	.80	.20	.50 (A)	6.00	1.50
V–T	Prop.	22,460	.72	.04	.46	.54	.50 (A)	9.82	9.68
	100/0	31,214	.83	.39	.60	.40	.50 (A)	13.50	9.00

For most subjects, auditing did not occur during all the 10-s intervals. Figure 2 shows number of audit responses per minute for each subject for the two distributions. The rate excludes time during which a contest was stopped (i.e., audits by a subject per minute of competition). To provide continuous feedback through interpersonal audits (comprised of two responses), approximately 12 audit responses would be needed per minute. As Figure 2 shows, only 1 subject approached this number, and most subjects were far below it. For 9 of the 12 subjects, the audit rate was higher for the 100%/0% distribution. A *t* test (paired two sample for means) showed a significant difference by distribution, $t(11) = 2.59$, $p < .05$. Figure 3 shows number of audit responses per minute for each pair for each contest (i.e., audit responses by both subjects per minute of competition). Higher rates with the 100%/0% distribution occurred across most contests, whether or not the contest was completed or stopped. With pairs instead of single subjects, the interpersonal audit rate would need to be approximately 23 responses per minute to achieve continuous feedback for both subjects. Some contests approached 70% of that rate, but most were far less.

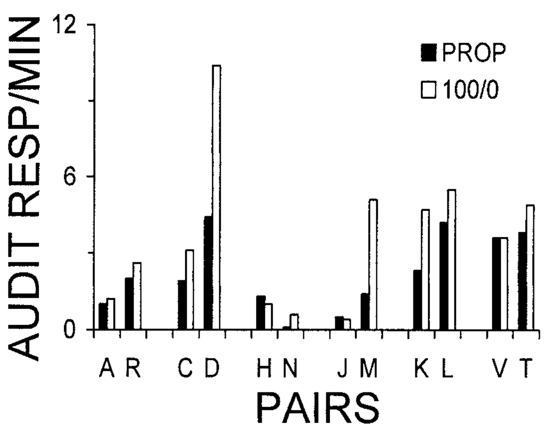

Fig. 2. Audit responses per minute for each subject in contests with proportional and 100%/0% reward distributions.

Figure 4 shows the patterns of audit responding within contests. The figure shows cumulative audit responses for each subject for contests during the final session. All but one of the audit responses was an interpersonal audit comprised of two responses. For Pairs H–N and A–R, no audits occurred in one and two of the final six contests, respectively. Cumulative records that show a proportion were contests that were stopped, and the proportion shows how much of the contest was completed. The letter to the right of the proportion shows the initial of the subject who stopped the contest. These records show that for 9 of the 12 subjects, intermittent au-

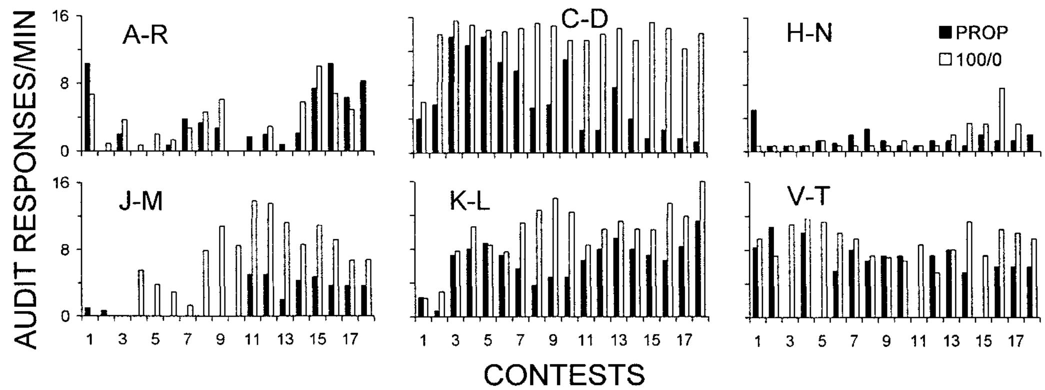

Fig. 3. Audit responses per minute for each pair for each of the 18 contests with proportional and 100%/0% reward distributions.

diting was typical throughout much of the contest, whether completed or stopped, with occasional short periods of continuous auditing. Only 2 subjects showed almost continuous auditing.

Over the series of contests, 1 subject typically emerged as the exclusive winner. Table 1 shows the proportion of completed contests won by each subject, the proportion of total responses in completed contests made by the winner, and earnings from completed contests. For all pairs except V–T, more contests were completed under the proportional than under the 100%/0% distribution. Few contests were stopped immediately, and because three pairs continued all contests under the proportional distribution, the data cannot be analyzed meaningfully by distribution type. For all pairs except K–L and V–T, 1 subject won 90% or more of contests in both distributions. For the six pairs, the proportion of total responses made by the winner in each pair (shown in Table 1) was correlated with the pair's overall rate of audit responses. For

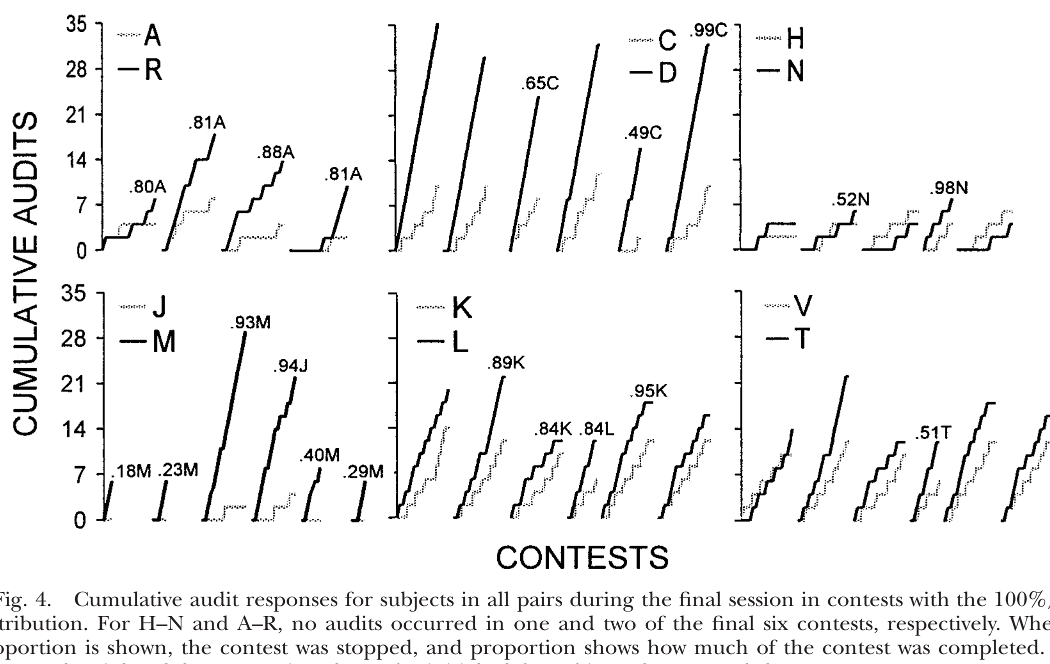

Fig. 4. Cumulative audit responses for subjects in all pairs during the final session in contests with the 100%/0% distribution. For H–N and A–R, no audits occurred in one and two of the final six contests, respectively. Where a proportion is shown, the contest was stopped, and proportion shows how much of the contest was completed. The letter to the right of the proportion shows the initial of the subject who stopped the contest.

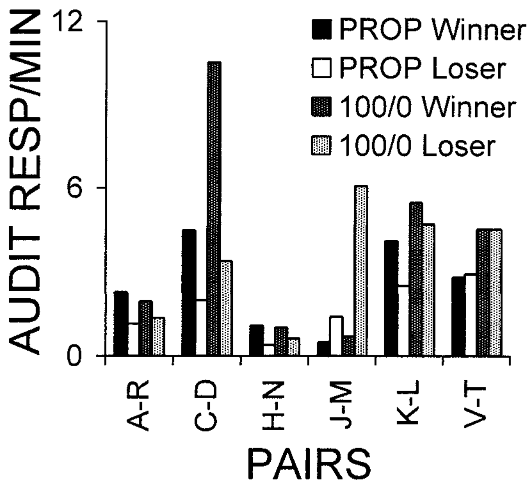

Fig. 5. Audit responses per minute by the overall winner and loser for contests with proportional and 100%/0% reward distributions.

100%/0% contests the Pearson product-moment correlation coefficient was −.53, and for proportional contests it was .21. Thus, for 100%/0% contests, the closer a pair's contests, the higher the rate of audit responses.

Figure 5 shows number of audit responses per minute by the overall winner and loser in each distribution. For all pairs but J–M and V–T, the winners' audit response rates were higher. Only in Pair J–M was the loser's rate higher. Both these pairs were among the most evenly matched competitively. The very high audit rates by Subject D, the winner of all completed contests in Pair C–D, were the result of a strategy she used to induce her opponent to remain in the 100/0% contests. As she described in answering the postexperiment question on button use, she slowed down to allow her opponent to catch up and occasionally get ahead during the contests. Then during the final 10 s, she responded at a very high rate in order to win the contest. This strategy required almost constant auditing.

To ascertain how interpersonal audit responses affected subsequent competitive responding, the number of responses a subject was ahead or behind as shown from an interpersonal audit (i.e., buttons pressed for both self and coactor's totals) was correlated with the subject's response rate during the 10-s interval that followed the interval during which the information was shown. Separate correlations were calculated for the periods during which the subject was behind or ahead as revealed by an audit. Number of responses behind or ahead were both coded as positive numbers. Figure 6 shows the Pearson prod-

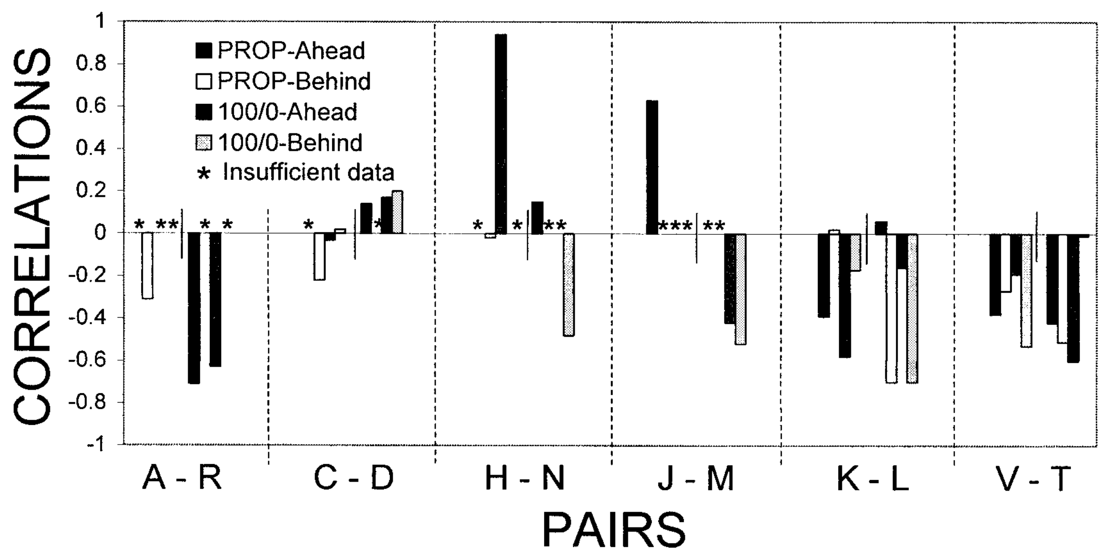

Fig. 6. Correlation coefficients showing the relation between the number of responses a subject was shown to be ahead or behind from an interpersonal audit and the subject's response rate during the next 10-s interval after the audit. Proportional and 100%/0% distributions are shown separately. Insufficient data indicates that fewer than six interpersonal audits were made.

uct-moment correlation coefficients for subjects in each pair. Correlations are not shown when fewer than six interpersonal audits were available, a number judged to be too small for a representative estimate. The audit information affected responding for 9 of the subjects, with correlations of at least moderate size (greater than .40 or −.40) for at least one condition. Most correlations were negative. Thus, whether audits revealed that subjects were behind or ahead, small differences in scores were followed by higher response rates, whereas large differences were followed by lower response rates. The pattern was similar whether the subject was the overall winner or loser in a pair. The exceptions were the large positive correlations for Subject H in H–N and Subject J in J–M. For these subjects, both winners overall, response rates were higher the greater the number of responses they were ahead.

In answering the postexperiment questions, subjects in five of the six pairs said they neither knew who their partner was nor talked to her. In Pair V–T, subjects spoke to each other outside the experiment, but said they made no agreements on how to compete. One of the subjects in each of two pairs, K–L and V–T, said she let her partner win on occasion. Subjects in Pair V–T were evenly matched, a condition that made the 100%/0% distribution attractive to both. Subject T said she slowed down (and also occasionally quit) in the proportional condition to ''let my arm rest to try to win the all or none.'' This behavior produced the substantially lower proportional response rates for this pair. Subject L in K–L said she ''slowed down a bit'' on occasion in hopes that her partner would later reciprocate and let her win. In answering the question regarding distribution preference, all subjects said they preferred the proportional distribution to the 100%/0%. That distribution produced higher earnings for all but 2 subjects. Reasons given for using the audit buttons focused on a desire to compare scores.

DISCUSSION

The comparison of reward distributions further confirms Schmitt's (1998) findings that basing the distribution on the relative performances of the competitors (i.e., a proportional distribution) produces more responses than basing it on a fixed distribution of 100%/0%. This replication occurred with longer, more frequent contests, but with fewer distribution and feedback conditions compared. The exception in this study, Pair V–T, had the characteristics under which 100%/0% contests should be maximally productive—almost evenly matched competitors. For this pair the present procedure, in which distributions were alternated, was apparently responsible for the substantial response differences between distributions, allowing 1 subject to rest during proportional contests in order to be able to work faster in the following 100%/0% contest.

Although audit responses could be made with little effort and at no monetary cost, no subject audited continuously, and only 1 audited most of the time. That subject, the winner in Pair C–D, reported that the auditing was part of a slowdown strategy to keep her partner from quitting 100%/0% contests. Most audits were interpersonal, including both self- and coactor's scores. In general, auditing occurred intermittently, and was more frequent in 100%/0% contests in which subjects were more likely to stop the contest when they were far behind. The information revealed by interpersonal audits was consequential for subsequent responding for most of the subjects. The most common pattern was an inverse relation between the size of the response differences displayed and subsequent response-rate increases. Whether the information revealed that subjects were behind or ahead, rates increased when the differences were small and decreased when they were large. Observing a small difference is the occasion on which a response increase is most likely to be consequential, in catching up with the opponent or in preventing the opponent from catching up.

With regard to the effects of auditing as ''news,'' all subjects, whether winners or losers, made at least some interpersonal audits. The pattern of intermittent instead of continuous auditing, however, is not consistent with the information processing view that any informative stimuli are reinforcing whenever they are available. Defined most simply, good news is evidence that one is ahead and bad news is evidence that one is behind. A more complex definition would also include whether the response difference is changing for better or worse over time. As with research by Fantino and his associates (Case, Ploog, & Fantino, 1990; Fantino, 1998a), bad news could be used in some constructive way, either by a change in responding to try to catch up if the difference were small or by quitting the contest and getting at least some reward if the difference were large. Both of these had greater consequences in 100%/0% contests than in proportional ones. For 100%/0% contests the consequence possible through a rate increase was $1.50, in contrast to a few cents in proportional contests. In addition, quitting the 100%/0% contest and earning 50 cents was more profitable for losers when a lead was insurmountable. In proportional contests, response differences were rarely so great that stopping the contest was more profitable for losers than the final distribution. These differences likely account for the more frequent auditing in 100%/0% contests, particularly those in which partners were evenly matched. This result is consistent with earlier findings of more frequent auditing with small score discrepancies (Buskist & Morgan, 1988; Vukelich & Hake, 1974). Consistent with the greater reinforcing effects of good news, auditing was more frequent by winners than losers regardless of distribution, but winners did not consistently choose to view such news (i.e., audit rates were well below the maximum).

With regard to the major variables comprising a competitive setting, reward distribution, the presence or absence of feedback, and the opportunity to obtain feedback via audits have now been investigated in a setting with similar features (Schmitt, 1998, and the present experiment). One unexplored feature that is likely to be important is the presence of the concurrent response that subjects can use to stop the competitive contest. Such a response is congruent with a choice among responses that is common in some everyday settings and also maintains participation of losing competitors when they are studied over a series of sessions. The absence of that response, however, would doubtless affect response patterns. Schmitt (1987, Experiment 4) conducted a limited study of the presence or absence of a lower paying alternative to competition. Unlike the present experiment, the alternative was a response that subjects could switch back and forth to during competition. Either the competitive or alternative response could be made on the average of once every 30 s. As in the present experiment, subjects losing in competition switched to the alternative response. In conditions in which the alternative was absent, competitive contests had a 100%/0% payoff after either 20 or 60 min, with response feedback. To ensure that subjects returned for the scheduled sessions, subjects were given a guaranteed monetary amount per session in addition to the earnings from competition. Competitive response rates were typically much higher than they were with the alternative present.

Because reward distribution affects reinforcement probability and auditing signals the likelihood of reinforcement, it seems likely that these two variables should affect competitive responding whether alternatives were present or not. With neither a reinforcing alternative to competition nor a guaranteed minimum, people would be likely to withdraw completely from competitive contests in which they were habitual losers (or perhaps respond in a desultory manner). But even here the reward distribution and the opportunity to audit would be predicted to affect the timing of the withdrawal, an issue that awaits study.

Another unexplored variable in the present setting is the cost of making an audit response. A cost could be incurred by varying the number of presses required to obtain feedback, or by assessing a small monetary cost for each press. The present experiment was designed originally to study the effects of cost using the latter procedure, assuming that most subjects would audit on most opportunities when an audit response entailed minimal cost. The study of cost did not proceed when subjects failed to audit at maximum frequencies, and most subjects audited at much lower rates. Contest length could be a factor. Much longer contests, which entail more effort, could make auditing more valuable as a means of avoiding unprofitable responding for subjects who are far behind or far ahead, thus allowing the study of cost.

In conclusion, the present results expand the findings from Schmitt's (1998) study, in which continuous performance feedback had only a small effect on total responses. Using a similar setting but requiring audit responses to receive feedback, the present study suggests that feedback is often sought, although far from continuously, and is consequential, as shown by its use in regulating responding within a contest. Overall audit patterns were consistent with the view that feedback is more often sought when it can lead to improved outcomes, although individual variation in seeking it was substantial.

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