The Effects of Objective Feedback on Performance When Individuals Receive Fixed and Individual Incentive Pay

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We examined whether objective feedback would enhance performance when individuals were paid monetary incentives. A two-by-two factorial design was used, with 123 college students assigned to incentive pay without feedback, incentive pay with feedback, fixed pay without feedback, or fixed pay with feedback. Participants attended six sessions and entered the cash value of simulated bank checks presented on a computer. Two-factor ANCOVAs were used to determine whether the number of checks completed correctly and time spent working differed. The number of checks completed correctly during a pretest was used as the covariate to control for keyboard proficiency. Incentives increased the number of checks completed correctly by 34 percent ($p < .001$, standardized effect size = .91); however, feedback had no effect ($p = 1.00$). The incentives increased the time spent working by 31 percent ($p < .001$, standardized effect size = 1.13); however, again feedback had no effect ($p = 1.00$). Although speculative, the results imply that feedback per se, absent evaluation, is unlikely to increase performance even when correlated with performance-contingent rewards.

Individual monetary incentives have been shown to improve performance (Condly, Clark, & Stolovitch, 2003; Jenkins, Gupta, Mitra, & Shaw, 1998) and are also quite prominent in business and industry (Dickinson, 2005; Ledford, Lawler, & Mohrman, 1995). Hewitt Associates (2002, 2005), for example, found that 45–47 percent of more than 1,000 companies surveyed had incentive systems where rewards were based on specific employee performance criteria.

The prominence of individual incentive systems is an indicator that they should be an important research topic for performance improvement researchers. In spite of this, however, empirical research has been sparse. In 1998, Jenkins and colleagues were able to locate only 39 studies for their meta-analytic review of the effects of individual financial incentives on performance. Similarly, when Bucklin and Dickinson (2001) reviewed the effects of individual monetary systems, they were able to identify only three thematic lines of research, with just a few studies in each thematic line. They found five studies that had systematically examined the effects of the percentage of base pay or total pay that was incentive-based, eight that had examined the effects of various schedules of incentive delivery, and two that had examined

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the effects of linear, accelerating, and decelerating piece-rate pay on performance.

Consistent with the general literature, Bucklin and Dickinson (2001) reported that monetary incentives improved performance in comparison to hourly pay in each thematic line of research. However, performance was comparable across variations in the incentive percentage, the schedule of delivery, and the amount of the per-piece incentive. Hantula (2001) arrived at similar conclusions in his review of the effects of schedules of reinforcement on organizational behavior. Moreover, his review included studies that examined both monetary and nonmonetary performance consequences. The conclusions of these authors derived from the results of both laboratory studies and field studies conducted in a variety of settings, although the types of tasks were restricted, for the most part, to rate-oriented tasks over which the performer had a great deal of control (such as trapping beavers, planting trees, passing tests on the basis of instructional units, doing auto repair). Reviewing the studies, Bucklin and Dickinson noted that frequent performance feedback was available to participants in most of the studies, leading them to propose that the feedback might have been the reason performance did not differ according to the incentive percentage, incentive amount, or schedule of delivery.

Studies Examining Individual Monetary Incentives and Performance Feedback

A number of studies have demonstrated that simultaneous implementation of monetary incentives and feedback improves performance. For example, a study by Shikdar and Das (2003) showed significant productivity differences for a fish-trimming task in a large fish processing plant owing to monetary incentives and feedback. Improvements were about 40 percent and 58 percent for the two experimental groups receiving monetary incentives and feedback compared to a control group receiving no incentives or feedback. Similarly, LaMere, Dickinson, Henry, Henry, and Poling (1996) conducted a study that examined the performance of truck drivers. Following implementation of a monetary incentive and feedback package, performance increased significantly and was maintained during the four-year follow-up.

There have also been a number of studies demonstrating how monetary incentives improved performance when feedback systems were already in place. For example, Gaetani, Hoxeng, and Austin (1985) improved the performance of two machinists when they added monetary incentives to feedback. They used a within-subject ABAC design, in which A = hourly pay, B = hourly pay with feedback, and C = commission compensation with feedback. When the participants self-monitored their own performance in the B condition (hourly pay with feedback), their performance level approximately doubled. Performance declined when feedback was removed in the second hourly pay condition. When the monetary incentives with feedback were then implemented, performance

increased once again and was considerably higher than performance during the hourly pay with feedback condition.

Dierks and McNally (1987) reported similar results with proof operators at a bank. They measured the number of checks processed in an hour by each proof operator. Initially, the employees processed an average of 1,065 items per hour. After implementing a weekly feedback graph, the performance level of the proof operators rose sharply to 2,100 items per hour. Management then added a monetary incentive system, and performance rose even further, until the employees were processing an average of 3,500 items per hour.

Although studies have documented that monetary and nonmonetary tangible rewards often enhance the effectiveness of feedback, few studies have examined whether feedback enhances the effectiveness of monetary and nonmonetary rewards. Additionally, as is discussed later, the results of those studies have been inconclusive. In addition to being practically important, the question of whether feedback enhances the effectiveness of monetary and nonmonetary tangible rewards is conceptually interesting because performance-contingent rewards are themselves a form of performance feedback. Yet a number of authors have discussed why feedback may indeed enhance the effectiveness of behavioral consequences (Balcazar, Hopkins, & Suarez, 1985–86; Bucklin, McGee, & Dickinson, 2003; Duncan & Bruwelheide, 1985–86; Prue & Fairbank, 1981; Kang, Oah, & Dickinson, 2003).

Although studies have documented that monetary and nonmonetary tangible rewards often enhance the effectiveness of feedback, few studies have examined whether feedback enhances the effectiveness of monetary and nonmonetary rewards.

Why Performance Feedback May Enhance the Effectiveness of Incentives

One possibility is that feedback may function as a discriminative stimulus (SD). Balcazar and coauthors (1985–86) suggested that feedback might initially function as an SD because of generalization from a person's reinforcement history. That is, historically rewards may have been offered when feedback was present but not when it was absent. Therefore when feedback is presented along with already existing behavioral consequences, it may evoke a higher level of performance. The higher level of performance may then be maintained by additional consequences, which, in the case of monetary incentives, would be the additional money earned in incentives.

Another possible explanation is that feedback may function as a conditioned reinforcer because of a history of feedback being delivered at the same time as other reinforcers (Bucklin et al., 2003; Duncan & Bruwelheide, 1985–86). Additionally, in many situations feedback is provided more frequently and more immediately than performance-contingent rewards and incentives are. Thus feedback may improve performance because it is more immediate and frequent than the rewards themselves, even though linked to those rewards.

Some authors have noted that the manner in which feedback is typically delivered violates the definitions of discriminative stimuli and conditioned reinforcers (Agnew & Redmon, 1992; Malott, 1992; Peterson, 1982). Namely, even though performance feedback is often more frequent and immediate than organizational rewards and incentives, the temporal delays are still too great for feedback to effectively function as either an SD or a conditioned reinforcer. Instead, these authors have suggested the effects of feedback can best be explained in terms of rule control, that is, verbal descriptions of the relevant contingencies rather than direct exposure to the actual contingencies. Such rules, however, are more effective if feedback is associated with some valued consequence. Thus all of these analyses suggest that feedback is more effective when it is correlated with performance-contingent consequences such as monetary incentives. It is also the case that verbal descriptions about receipt of delayed rewards may influence behavior more if frequent, immediate feedback is provided because the feedback may repeatedly prompt employees to state rules such as "I have earned five dollars in incentives. If I produce more, I will earn even more money."

Studies Examining Whether Feedback Enhances Incentivized Performance

The results of studies that have examined whether feedback enhances the effectiveness of incentives have not been conclusive. In a careful reanalysis of the Hawthorne studies, Parsons (1974) maintained that the performance improvements seen in the first Relay Assembly Test Room experiment were due to performance feedback and a contingent financial reward system. He compared the results of that study to the results of a second study conducted in the same setting. The second resembled the first, except that performance feedback was not present. Similar to the first experiment, the production rate in the second experiment rose immediately when the new pay system was introduced. Unlike the first experiment, the production rate in the second experiment did not continue to rise during the eight-week period of time that the new pay system was in effect. These data suggest that feedback may have enhanced the effectiveness of the monetary incentives.

Smoot and Duncan (1997) investigated the effects of individual monetary incentives with and without feedback in a laboratory simulation. Monetary incentives and feedback were initially provided to participants for constructing parts made from pop beads. Feedback was then removed, and performance actually increased. This unusual result was probably because during the feedback condition participants tallied the number of parts they produced as they assembled them. This procedure reduced the time available for making the parts, which is a serious confound given that the sessions were only 15 minutes.

Bucklin et al. (2003) also tried to isolate the effect of feedback on individual monetary incentives. They employed a within-subject ABAC

design, in which A = monetary incentives, B = monetary incentives with feedback, and C = hourly pay with feedback. They used a computerized work simulation task called Synwork, which was designed to assess complex performance demands relevant to many work settings (Elsmore, 1994). Synwork presented participants with four work tasks simultaneously, involving arithmetic, memory, visual monitoring, and auditory monitoring. Participants earned points for correct responses. The performance of six of the seven participants increased when feedback was added to the monetary incentives. Although feedback improved performance, the performance of the participants did not reverse after the feedback was removed in the second A condition, thus limiting the conclusions that could be drawn. To demonstrate that the improvements were not due to other variables, given the within-subject reversal design, performance would have had to return to the level seen in the first A phase.

Ultimately, no studies have clearly documented the effect that performance feedback has on a monetary incentive system.

It is possible, as suggested by Bucklin et al. (2003), that the feedback resulted in a higher level of performance that was then maintained by the additional incentives. It is also possible that self-produced feedback or environmental changes initiated by the feedback procedure could not be removed. For example, participants reported anecdotally that the feedback made them more aware of the amount of time they spent performing the task, their overall speed of responding, and the amount of time they allocated to the various subtasks, which affected how many points they earned. If true, a within-subject reversal design is not an appropriate experimental design to use.

Rationale and Purpose of the Current Study

Ultimately, no studies have clearly documented the effect that performance feedback has on a monetary incentive system. In fact, an extensive literature search did not produce any study that examined how performance feedback influenced the effectiveness of any type of behavioral consequence. Nonetheless, this is an important research area. Foremost, if performance feedback does improve the gains made by monetary incentives, this means that feedback should be added to existing monetary incentive systems. Most organizations do not provide feedback to their employees even though they pay incentives (Buyniski, 1995). Another implication is that this may help explain the nondifferential responding obtained across variations in performance-pay systems, specifically across variations in the percentage of total and base pay earned in incentive pay, the schedule of incentive delivery, and the amount of the per-piece incentive (Bucklin & Dickinson, 2001). That is, if feedback does enhance the effectiveness of monetary incentives, it would lend support to Bucklin and Dickinson's suggestion that feedback might have been responsible for maintaining performance under these variations in performance-pay systems.

Definitions of *feedback* vary widely, as do procedures (Alvero, Bucklin, & Austin, 2001; Ilgen, Fisher, & Taylor, 1979; Prue & Fairbank, 1981). These differences obscure the effects of objective feedback per se. In their comprehensive review of the effects of feedback on organizational behavior, Ilgen and colleagues (1979) stated: "The diverse elements subsumed under the single rubric of feedback may share the property of conveying some degree of information about past behavior, but they share little else. As a result, many factors often are confounded with the feedback stimulus, which makes it difficult, if not impossible, to ascertain the effects of feedback per se" (p. 349).

For the purposes of our study, we defined feedback simply as objective information about past performance. Our goal was to determine whether such feedback would enhance performance as individuals receive monetary incentives because the feedback was correlated with valued rewards (that is, the incentives). Though such feedback is typically accompanied by praise, prompts, or criticism from supervisors and peers in work settings and these events themselves are often reasonably referred to as feedback, they could increase performance. This would confound the effects of the objective performance feedback, as noted by Ilgen and coauthors. Thus in this initial investigation, we restricted our feedback procedure to objective information about past performance.

In the current study, we used frequent immediate feedback for two reasons. First, frequent feedback was used in the two studies in which the results, though inconclusive, support the hypothesis that feedback may enhance the effectiveness of monetary incentives (Bucklin et al., 2003; Parsons, 1974). Second, Kang and colleagues (2003), in a laboratory study, compared the effectiveness of relatively immediate and delayed feedback when participants were paid individual monetary incentives and found that the more immediate feedback significantly increased performance. This was the only study we could locate that compared the relative effects of feedback immediacy when individuals were paid incentives.

The current study controlled for two potential confounds that might have eliminated performance differences under the incentive and feedback conditions: the lack of attractive alternative activities and the presence of the experimenter (Bucklin et al., 2003; Matthews & Dickinson, 2000; Mawhinney, 1975). In relatively short experimental sessions, if individuals are not given attractive alternatives they might work at a maximum rate, regardless of the presence or absence of feedback and incentives, simply because there is nothing else to do. This differs from a typical work setting where a variety of alternative activities often compete effectively with work. In the current study, seven computer games served as alternative tasks.

In a simulated laboratory setting, it is not possible to duplicate the variety of attractive off-task activities that exist in the workplace. Computer games, however, have been used as alternative tasks in prior incentive studies and shown to result in off-task behavior (Bucklin et al., 2003; Matthews & Dickinson, 2000). Additionally, computer games have

ecological validity; workers have access to computer games at their workstations and do play computer games as an alternative to working (Betts, 1995; Eng & Schwartz, 1993; Klett, 1994). The time spent performing the experimental task was recorded to determine whether any changes in performance were due to this factor. To ensure that the computer games were attractive activities for participants, participants were selected on the basis of their interest in playing the specific games used in the study.

In work settings, supervisors often punish nonproductive behavior and reinforce productive behaviors. Thus workers may be more productive when the supervisor is present. It is possible that the presence of an experimenter would affect behavior similarly, unrealistically inflating performance and eliminating performance differences that might otherwise occur. To control for this potential confound, the experimenter was not present during experimental sessions.

It was important to select a work task for which feedback would be useful. We used a rate-oriented task in which hundreds of work units are typically produced so that performers could not monitor their own progress accurately. Otherwise, participants could have self-generated their own feedback, making it impossible to withhold. The nature of the task (a data entry task that simulates the job of a proof operator at a bank), however, may limit generality.

Because this study was a laboratory simulation, questions arise with respect to generality. Opsahl and Dunnette (1966), in their classic paper "The Role of Financial Compensation in Industrial Motivation," appealed to researchers to conduct laboratory studies so that the effects of financial incentives could be isolated from administrative changes that accompany them in the work place. Concerns that the results of the study will not generalize to actual work settings, however, are legitimate, and caution should be exerted in discussing the relevance of the results. Nonetheless, researchers who have compared laboratory and field studies that investigated feedback and incentives report the results to be similar (Hantula, 2001; Jenkins, 1986; Jenkins et al., 1998; Locke, 1986). In the introduction of a collection of studies that examined the generality of laboratory studies, Locke (1986) stated: "Both college students and employees appear to respond similarly to goals, feedback, incentives, participation, and so forth, perhaps because the similarities among these subjects (such as in values) are more crucial than their differences. Task differences do not seem to be overwhelmingly important" (p. 6).

Method

Participants

Participants were 123 male and female college students. To be included, participants must have indicated on a questionnaire that they played one of the seven computer games that served as the off-task activities at least one hour a month. They also were required to pass a short

quiz about the pay system (either fixed or incentive pay, depending on the condition to which they were assigned) to ensure they understood it.

Setting and Apparatus

The experimental setting consisted of a small laboratory room with an adjustable chair, computer, keyboard, mouse, and gel palm rest. The experimental task was a check-proofing task, similar to the job of a proof operator at a bank. A computer program displayed a graphic of a check with randomly generated dollar amounts between $10.00 and $999.99. The participant entered the amount using the keypad and pressed Enter to summon up another check. The computer had seven computer games available for play at all times.

Dependent Variables

The main dependent measure was the average number of checks completed correctly per session. Secondary dependent variables were (1) the number of minutes spent performing the work task, (2) the number of correctly completed checks per minute while working (speed), and (3) the percentage of correctly completed checks (accuracy). The computer automatically recorded the number of checks completed, the number completed correctly, and the minutes spent performing the task. Speed in working and the percentage of checks completed correctly were calculated from the data collected by the computer.

Independent Variables

The independent variables were the pay system (individual incentive pay versus fixed pay) and feedback (the presence or absence of feedback). There were four conditions: (1) individual incentives without feedback, (2) individual incentives with in-session feedback, (3) fixed pay without feedback, and (4) fixed pay with in-session feedback. To control for the fact that participants in the two incentive groups and the fixed-pay-with-in-session-feedback group knew that their performance was being monitored (otherwise, incentives and feedback could not be delivered), participants in all groups were told that the experimenter would tell them how many checks they completed correctly during each session after the study was over. This information was not considered to be "feedback," however, because the participants did not have the opportunity to engage in the task again, and hence the information about performance could not influence their performance. All participants were paid in cash at the end of the study, rather than during. The reason for the delayed payment was that the amount of the incentive pay could serve as an effective form of feedback for participants in the monetary-incentive-without-feedback condition, thus introducing a confound.

Individual Monetary Incentives Without Feedback. Participants received $.006 per check completed correctly.

Individual Monetary Incentives With In-Session Feedback. Participants received $.006 per check completed correctly and in-session feedback. The feedback consisted of an on-screen display indicating the total

number of checks completed correctly throughout the session and the average number of checks completed correctly per minute. The rate was updated every 30 s.

Fixed Pay Without Feedback. Participants were paid $5.75 per session regardless of performance.

Fixed Pay With In-Session Feedback. Participants were paid $5.75 per session, regardless of performance, and received in-session feedback. The feedback was the same as the feedback just described for individual monetary incentive with in-session feedback.

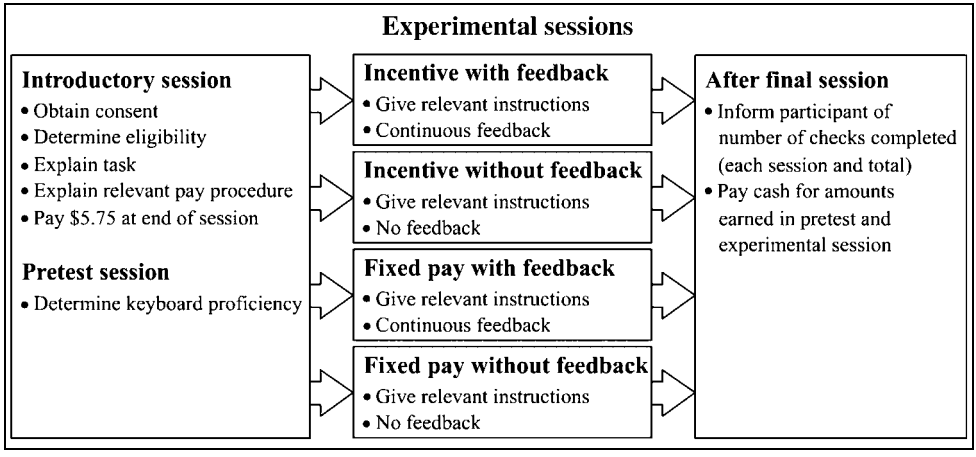
Experimental Design and Statistical Analyses

A two-by-two factorial design was used with participants randomly assigned to one of the four groups. There were 30 participants in the group with fixed pay with in-session feedback and 31 participants in each of the other three conditions. Two-factor ANCOVAs were used to analyze the number of checks completed correctly, the time spent performing the experimental task, and the speed of check completion. The number of checks completed correctly during a pretest session was used as the covariate, to control for initial keyboard proficiency. A two-factor ANOVA was used to analyze the percentage of checks completed correctly. An ANOVA was used rather than an ANCOVA because the covariate was not significantly correlated with this variable. Because multiple dependent variables were examined, to control for the family error rate p values were adjusted using the correlation corrected Bonferroni method (Huitema, 1980, 2006; Tamhane, 1996).

Experimental Procedures

Participants attended an introductory session, one 45-minute pretest session during which keyboard proficiency was assessed, and six 45-minute experimental sessions. Six experimental sessions, rather than one, were conducted so that the participants contacted the experimental contingencies repeatedly, increasing confidence that effects were due to the independent

FIGURE 1. Experimental Design and Procedures.



variables rather than to social demands of the experimental setting. Figure 1 displays the experimental design and procedures.

Introductory Session. The experimenter explained the task and relevant pay procedures to participants and then administered the pay quiz. Participants who passed the quiz practiced the task and computer games. The experimenter then paid them $5.75 for attending the session.

Pretest Session. The pretest session was used to obtain the covariate for the ANCOVA analyses. During this session, participants were paid $5.75 for performing the experimental task. The number of checks completed correctly was used as a covariate to control for differences in keyboard proficiency. Although a more accurate assessment would probably have been obtained if we had paid participants a per-check incentive, previous research has shown that participants who receive fixed pay often perform much lower after they have been paid incentives than otherwise. Thus we did not want to expose participants assigned to the two fixed-pay groups to incentives prior to the six experimental sessions.

Experimental Sessions. Each participant attended six 45-minute experimental sessions, three per week. Before each session, the experimenter reminded participants how they would be paid and also told them they could take breaks whenever they liked for as long as they liked. Participants were also told they could play the computer games or just stretch and relax during breaks. The experimenter then left the room, returning to end the session 45 minutes later.

After participants completed their last session, the experimenter told them how many checks they completed correctly each session and how many total checks they completed correctly during the study. He then paid them in cash.

Results

Number of Checks Completed Correctly

Table 1 displays the means and standard deviations for the number of checks completed correctly, Table 2 displays the adjusted means based on the ANCOVA, and Table 3 displays the ANCOVA source table with adjusted p values. The incentives significantly increased performance relative to fixed pay ($F = 39.46$, adjusted $p = 0.00$, standardized effect size = .91); however, feedback did not affect performance ($F = 0.05$, adjusted $p = 1.00$, standardized effect size = .04).

Cost per Check

Cost is an important consideration when ascertaining the value of the performance differences between the incentive and fixed pay. Participants in the incentive conditions were paid $0.006 per check; those in the fixed pay conditions received $5.75 per session. Participants in the fixed-pay groups completed an average of 553.9 checks per session (see Table 1); thus the average cost per check was $0.01. This represents a 67 percent

TABLE 1
RAW MEANS FOR THE NUMBER OF CORRECTLY COMPLETED CHECKS

	Feedback Variable					
	In-Session Feedback		No Feedback		Overall	
Pay system	Mean	*SD*	Mean	*SD*	Mean	*SD*
Incentive	815.1	187.8	743.1	182.6	779.1	187.3
Fixed	560.4	256.1	547.5	220.2	553.9	236.6
Overall	687.7	256.6	645.3	223.6		

TABLE 2
ADJUSTED MEANS FOR THE NUMBER OF CORRECTLY COMPLETED CHECKS

	Feedback Variable		
	In-Session Feedback	No Feedback	Overall
Pay system	Mean	Mean	Mean
Incentive	772.6	754.8	763.7
Fixed	567.4	571.4	569.4
Overall	670.0	663.1	

TABLE 3
ANCOVA SOURCE TABLE FOR THE NUMBER OF CORRECTLY COMPLETED CHECKS

Source	*df*	SS	MS	*F*	*p*	p_{adj}
Feedback variable (A)	1	1420	1420	0.05	0.82	1.00
Pay system (B)	1	1143729	1143729	39.46	0.00	0.00
A × B	1	3642	3642	0.13	0.72	1.00
Error	118	3419746	28981			
Total	122					

increase in the cost per check. Extrapolating, if participants in the fixed-pay groups had completed the same average number of checks as those in the incentive pay groups (779.1; see Table 1), the labor costs associated with their performance would have been \$7.79 per session (\$0.01 × 779.1), in contrast to \$4.67 per session for those in the incentive pay groups.

Minutes Spent Performing the Experimental Task

Table 4 displays the means and standard deviations for the number of minutes spent performing the experimental task, Table 5 displays the

TABLE 4
RAW MEANS FOR THE MINUTES SPENT PERFORMING THE WORK TASK

	Feedback Variable					
	In-Session Feedback		No Feedback		Overall	
Pay system	Mean	*SD*	Mean	*SD*	Mean	*SD*
Incentive	42.1	4.6	41.4	5.0	41.7	4.8
Fixed	32.0	11.1	31.6	10.6	31.8	10.8
Overall	37.0	9.8	36.5	9.6		

TABLE 5
ADJUSTED MEANS FOR THE MINUTES SPENT PERFORMING THE WORK TASK

	Feedback Variable		
	In-Session Feedback	No Feedback	Overall
Pay system	Mean	Mean	Mean
Incentive	41.44	41.53	41.48
Fixed	32.05	31.98	32.01
Overall	36.74	36.75	

TABLE 6
ANCOVA SOURCE TABLE FOR THE MINUTES SPENT PERFORMING THE WORK TASK

Source	*df*	SS	MS	*F*	*p*	p_{adj}
Feedback variable (A)	1	0.00	0.00	0.00	0.995	1.00
Pay system (B)	1	2716.97	2716.97	40.32	0.000	0.00
A × B	1	0.24	0.24	0.00	0.953	1.00
Error	118	7950.61	67.38			
Total	122					

adjusted means, and Table 6 displays the ANCOVA source table with adjusted *p* values. This analysis also served as a manipulation check to determine whether participants actually found the games to be attractive off-task activities. Participants who received incentives spent significantly more time performing the task than did participants who received fixed pay ($F = 40.32$, adjusted $p = 0.00$, standardized effect size = 1.13); however, feedback did not affect time on task ($F = 0.00$, adjusted

$p = 1.00$, standardized effect size = .00). These data also suggest that the participants found the computer games to be attractive alternative tasks. Fixed-pay participants spent an average of 13.2 minutes, 29 percent of the total session time, engaged in off-task activities, while incentive participants spent 3.3 minutes, 7 percent of the total session time.

Speed of Check Completion

Table 7 displays the means and standard deviations for the number of checks completed per minute when working, Table 8 displays the adjusted means, and Table 9 displays the ANCOVA source table with adjusted p values. Neither incentives nor feedback significantly affected speed of

TABLE 7
RAW MEANS FOR THE NUMBER OF CHECKS COMPLETED PER MINUTE

	Feedback Variable					
	In-Session Feedback		No Feedback		Overall	
Pay system	Mean	*SD*	Mean	*SD*	Mean	*SD*
Incentive	19.6	3.6	18.2	3.6	18.9	3.6
Fixed	17.5	3.7	17.2	3.0	17.3	3.3
Overall	18.6	3.8	17.7	3.3		

TABLE 8
ADJUSTED MEANS FOR THE NUMBER OF CHECKS COMPLETED PER MINUTE

	Feedback Variable		
	In-Session Feedback	No Feedback	Overall
Pay system	Mean	Mean	Mean
Incentive	18.74	18.41	18.58
Fixed	17.63	17.69	17.66
Overall	18.19	18.05	

TABLE 9
ANCOVA SOURCE TABLE FOR THE NUMBER OF CHECKS COMPLETED PER MINUTE

Source	*df*	SS	MS	*F*	*p*	p_{adj}
Feedback variable (A)	1	0.57	0.57	0.12	0.733	1.00
Pay system (B)	1	25.59	25.59	5.27	0.023	0.08
A × B	1	1.14	1.14	0.24	0.629	1.00
Error	118	573.00	4.86			
Total	122					

TABLE 10
MEANS FOR THE PERCENTAGE OF CORRECTLY COMPLETED CHECKS

	Feedback Variable					
	In-Session Feedback		No Feedback		Overall	
Pay system	Mean	*SD*	Mean	*SD*	Mean	*SD*
Incentive	98.35	1.01	98.51	0.83	98.43	0.92
Fixed	97.26	3.21	97.98	1.44	97.62	2.48
Overall	97.80	2.41	98.25	1.19		

TABLE 11
ANOVA SOURCE TABLE FOR THE PERCENTAGE OF CORRECTLY COMPLETED CHECKS

Source	*df*	SS	MS	*F*	*p*	p_{adj}
Feedback variable (A)	1	6.119	6.119	1.77	0.186	0.69
Pay system (B)	1	20.043	20.043	5.78	0.018	0.06
A × B	1	2.394	2.394	0.69	0.408	1.00
Error	119	412.407	3.466			
Total	122					

performance when participants were working on the experimental task ($F = 25.59$, adjusted $p = 0.08$, standardized effect size = .01 and $F = 0.12$, adjusted $p = 1.00$, standardized effect size = .00, respectively).

Percentage of Checks Completed Correctly

Table 10 displays the means and standard deviations for the percentage of checks completed correctly, and Table 11 displays the ANOVA source table with adjusted p values. Accuracy was high, varying by no more than 1.25 percent across the conditions. Given these data, it is not surprising that neither incentives nor feedback significantly affected this variable ($F = 5.78$, adjusted $p = 0.06$, standardized effect size = .00 and $F = 1.77$, adjusted $p = 0.69$, standardized effect size = .01, respectively). These data may be primarily important because they indicate that the incentives did not decrease accuracy; this is probably due to incentives being provided only for *correctly* completed checks.

Discussion

Although studies have shown that performance-contingent consequences augment the effectiveness of performance feedback, it has not yet been determined whether the reverse is true; does feedback enhance the effectiveness of performance-contingent rewards? The main purpose of

this study was to determine whether feedback would elevate performance when individuals were paid a monetary incentive. In the current study, monetary incentives significantly improved performance relative to fixed pay, demonstrating that the incentives were indeed rewards for participants; however, feedback did not enhance performance, regardless of whether participants received fixed or incentive pay.

One interpretation of the findings is that participants performed at a maximum level when paid incentives and thus were unable to perform any higher. Though possible, this interpretation is rendered not likely; participants in the fixed-pay-with-feedback condition did not perform better than those receiving fixed pay without feedback.

Balcazar et al. (1985–86) suggested that feedback might enhance performance if individuals were already receiving incentives because the feedback might prompt better performance thanks to past experiences, and then that performance might be maintained by the additional incentives. Our results do not support this conceptualization. On the other hand, it might be that our participants did not have a history in which feedback was correlated with rewards, or if they did then the type of objective feedback we used might have been too dissimilar to the type of feedback they received in the past for such generalization to occur.

Others suggested that feedback might come to function as a conditioned reinforcer because of its correlation with the incentives, and might increase performance because the feedback is delivered more immediately and frequently than the incentives themselves (Balcazar et al., 1985–86; Bucklin et al., 2003; Duncan & Bruwelheide, 1985–86). Once again, our results do not support this suggestion; nor do they support the position that frequent, immediate feedback as an antecedent stimulus might cause individuals to state verbal rules to themselves ("I have correctly completed 800 checks. If I complete more, I will earn more money in incentives"), which then might increase performance. In the current study, because participants were not paid until they had completed all six sessions their performance was controlled not by the money itself but by the promise of payment. Given the rate-based task used in the study, the line of sight between the number of checks completed correctly and the incentive pay might have been so clear (Lawler, 2000) that the objective feedback was not necessary. Conceptually, it may be that performance was controlled by a rather simple verbal description of the relationship between performance and the incentives ("The more checks I complete, the more money I will earn"), which made the feedback superfluous. Additionally, the verbal description might have been evoked by aspects of the situation (such as the daily instructions by the experimenters, the laboratory setting itself, and so on) rather than the feedback. If true, then feedback would not be expected to enhance performance as either a conditioned reinforcer or an antecedent stimulus; rather, the feedback would remain a completely neutral stimulus. This analysis is highly tentative. Covert verbal descriptions of contingencies

cannot be directly observed; nor have attempts been made to measure them in incentive studies.

Although we can only speculate about the reasons feedback failed to elevate performance, we believe it is likely that the results were due to the type of feedback used. Because the investigation was designed to examine whether performance feedback per se would increase incentivized performance, we restricted feedback to objective information about task performance. No evaluative statements were given to participants about their performance. As indicated earlier, this was done because the evaluative statements (praise and criticism) might have acted as rewards for participants in and of themselves. Thus the results of the study could not have been attributed solely to the feedback procedure. This analysis has important implications for interpretation of the present results. Objective performance feedback *alone* may be insufficient to increase performance even when wages are performance-contingent.

Studies examining objective performance feedback by itself are rare. A close look at many previous studies reveals that performance feedback is often accompanied by evaluative statements. That is, supervisors provide praise or criticism based upon the feedback. For example, Brown and Sulzer-Azaroff (1994) and Wilson, Boni, and Hogg (1997) described their interventions as feedback alone, and the interventions were classified as such in a subsequent review (Alvero et al., 2001). However, in both studies the managers who delivered the feedback also gave praise for improved performance.

In actual work organizations, it is extremely difficult to determine whether a feedback intervention is in fact a feedback-*alone* intervention. This is especially the case when supervisors provide the feedback, as in the field studies just mentioned. Employees have a history in which their supervisors have evaluated their performance. Given that such an evaluation has in the past been correlated with contingent consequences (at least to some degree), even though the performance reward contingency for the newly targeted performance may not be explicitly explained or stated, the supervisory feedback may "act much like a more formal change in an employees' job description or contract. The overall impact is 'to notify' employees of the new or now to be enforced contingencies operating in the organization" (Prue & Fairbank, 1981, p. 12). This notification, of course, implies evaluation. Thus despite the fact that the authors of many field studies and later reviewers have labeled interventions as feedback-alone interventions, other controlling variables remain quite plausible.

Four studies lend credibility to our supposition that feedback alone is not sufficient to improve performance, although unlike ours none explicitly linked feedback to performance-contingent rewards. Two were applied studies; two were laboratory studies. The former (Brown, Willis, & Reid, 1981; Crowell, Anderson, Abel, & Sergio, 1988) directly compared feedback alone with feedback plus approval or praise. Brown and colleagues found that feedback alone resulted in no lasting increase in

performance. However, when approval was later added to the feedback, performance increased greatly and was maintained over time. Crowell and coauthors instituted a feedback-alone condition, in which managers gave numerical scores to employees without evaluation. Treatment integrity measures were taken to ensure that feedback was delivered without evaluation. Although performance increased slightly, it did not reach the minimal desired level during the feedback condition. However, when social praise was added, performance exceeded the desired level, suggesting that praise was necessary for significant performance improvement.

In one of the two laboratory studies, Chapanis (1964) attempted to isolate the "purely motivational effect of knowledge of performance from its informational and rewarding aspects" (p. 263). College students, who were paid hourly, punched digits into a Teletype tape one hour a day for 24 days. To increase the realism of the task, they were told that they were programming a computer. The research assistant deliberately acted as though she did not care how well they performed. In two of three feedback groups, participants could see a counter that tallied every stroke. In the third group, participants wrote down their output three times during the session. None of the feedback groups performed better than a group that did not receive feedback.

In the laboratory study by Das (1982), college students drilled holes in steel connector plates using a drill press. Sessions lasted one hour. One group received feedback on the number of holes they drilled. An electric counter provided this feedback during the session. Another group received feedback along with the percentage of good holes punched every fifteen minutes. Neither group performed better than a control group that did not receive any feedback. However, a group that received both types of feedback along with a production standard performed significantly better than the control group. Further, two groups that received production standards ("normal" or "hard") without feedback did not perform better than the control group. Thus only the group that received feedback and performance standards performed significantly better than the control group that received neither.

When performance standards are present, they imply that the performance of individuals will be evaluated against this standard. Thus Das's results (1982) are consistent with the contention that feedback is not effective unless some type of evaluation is implied or explicitly given. It is also not surprising that feedback with goal setting (that enables evaluation of performance) has generally been found to improve performance more than either alone (Fellner & Sulzer-Azaroff, 1984; Ilgen et al., 1979).

Others have also argued that an evaluative component is necessary for feedback to affect performance (Ilgen et al., 1979; Kopelman, 1986; Prue & Fairbank, 1981). In keeping with this analysis, most current definitions of *performance feedback* (as opposed to the definition "knowledge of results") imply some type of evaluative or comparative component, as did the cybernetic and systems theoretical roots of the term (Duncan &

Bruwelheide, 1985–86). For example, Rummler and Brache (1995) defined feedback as "information that tells performers what and *how well* they are doing" (p. 66; italics added). Similarly, in their review of feedback studies Ilgen and coauthors stated, "Thus, we conclude that feedback is information about *appropriateness* of past performance" (p. 351; italics added). Our study demonstrates that performance feedback without an evaluative component may not affect performance, even if explicitly correlated with performance contingent rewards.

We used computer-generated objective performance feedback, which might also have influenced the results. The source of the feedback may affect how objective feedback affects performance (Alvero et al., 2001; Balcazar et al. 1985–86; Ilgen et al., 1979; Prue & Fairbank, 1981). Supervisors, for example, typically have control over an array of valued rewards for employees. This, combined with the long-term nature of their relationship with the employee (as well as their personal relationship), could well increase the effectiveness of objective performance feedback (Balcazar et al.; Ilgen et al.; Prue & Fairbank). To date, however, this issue remains largely unresolved. Nonetheless, the results of the two applied studies discussed earlier (Brown et al., 1981; Crowell et al., 1988) suggest that objective performance feedback from supervisors has only a limited effect on employee performance.

In addition to the type of feedback we used, the nature of the task might have contributed to the results. In the present study, participants were already proficient (or at least relatively so) with data entry and keyboarding tasks and therefore could readily identify correct performance. Thus the feedback might have been superfluous (Baumeister, Hutton, & Cairns, 1990) or even distracting. If so, participants may not have looked at or attended to the feedback. If that was the case, the possibility remains that this type of feedback might be effective when performers are less skilled on the task or when correct performance is not so easily identified (Alavosius & Sulzer-Azaroff, 1990; Annett, 1969). However, the properties of the task that influence the effectiveness of feedback have not yet been determined.

Several limitations to the generality of the results are important to mention. First, the study was a laboratory simulation, which limits the degree to which one can assume generality to actual work settings. Nonetheless, as indicated earlier, in general the results of laboratory and applied studies that examined monetary incentives and feedback have been similar. Second, the manner in which feedback was provided in this study is not representative of how feedback is often imparted in work settings. Computer-delivered objective feedback was used in an attempt to eliminate evaluation and better identify causal variables. In most work settings a supervisor typically delivers feedback, and it is likely that such feedback includes some degree of evaluation. Third, as noted earlier, the task was a repetitive data entry task and performers were already quite skilled on it. Different results may be obtained with other types of task.

Conclusions

Individual monetary incentives produced significantly higher performance than fixed pay, from both a statistical and a practical perspective. The gains were because participants who received incentives spent more time working, rather than working faster or more accurately. Perhaps as important, even though incentives increased performance they did not decrease accuracy. However, the incentives were based on both rate and quality. If they had been based only on rate, then these results might well have been different. Our results extend the incentive literature because few studies have documented how incentives increase performance.

Objective feedback alone did not affect performance, regardless of whether pay was performance-contingent or fixed. The feedback in the current study did not contain an evaluative component; it was restricted to objective information about task performance. As we have noted, this is not the type of feedback that commonly occurs in work settings, where supervisors praise, prompt, or criticize employees in an attempt to influence their performance. We used the type of objective feedback we did in the study because the study was designed to examine whether objective feedback per se would increase incentivized performance because it was correlated with the incentives, which were valued rewards. However, this type of feedback did not influence performance in the current study. The results of our study extend the feedback literature by suggesting that even when objective performance feedback is explicitly correlated with performance-contingent rewards, it is unlikely to be effective. Rather, some type of evaluative component may be necessary for feedback to enhance performance.

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