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The Differential Effects of Performance Monitoring and Performance Contingent Consequences in a Laboratory Setting

Julie A. Glasser
Western Michigan University

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THE DIFFERENTIAL EFFECTS OF PERFORMANCE MONITORING 
AND PERFORMANCE CONTINGENT CONSEQUENCES 
IN A LABORATORY SETTING

by

Julie A. Glasser

A Thesis 
Submitted to the 
Faculty of The Graduate College 
in partial fulfillment of the 
requirements for the 
Degree of Master of Arts 
Department of Psychology

Western Michigan University 
Kalamazoo, Michigan 
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THE DIFFERENTIAL EFFECTS OF PERFORMANCE MONITORING AND PERFORMANCE CONTINGENT CONSEQUENCES IN A LABORATORY SETTING

Julie A. Glasser, M.A.
Western Michigan University, 1992

A simulated work task, consisting of paper and pencil quality control inspection, was used to examine the effects of performance monitoring and performance-contingent feedback on the quality and quantity of work produced. Six subjects were exposed to two treatment conditions. During monitoring only, a supervisor checked performance by asking subjects about their progress. During performance-contingent feedback, a supervisor informed subjects of the number of correct inspections completed on a sample page and summarized the quality of their work in a brief statement. Performance was measured in terms of error detection accuracy (errors missed and false error detections) and rate of correct inspection responses (number correct per minute). The data indicated that monitoring alone had no consistent effect on performance relative to a no-supervision baseline, and that the addition of performance contingent feedback to monitoring improved accuracy and increased inspection rates for four of the six subjects. The results are discussed in terms of their implications for the design of effective supervision programs.
ACKNOWLEDGEMENTS

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I could not have completed this research as efficiently without help from my friends and colleagues, Iser DeLeon, and Cheryl Knight. Their advice and expertise in the field helped make this experience enjoyable even in times of turmoil. In addition, I want to thank my sister, Laurie Glasser, and my parents, Carole Cambridge, and Stephen P. Glasser, for their encouragement and support.

Julie A. Glasser
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The differential effects of performance monitoring and performance contingent consequences in a laboratory setting

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A prominent approach to managing individual performance is performance management (PM). Daniels (1989) defines PM as, "a systematic approach to managing people at work that relies on positive reinforcement as the major way to maximize performance" (p. 4). PM is systematic in that behaviors are specified before results are expected. In addition, a means to measure these behaviors is developed so that data can be collected and changes in behavior can be assessed. Finally, PM includes methods to evaluate the results of an intervention.

The success of PM is evident in consistent replications of effectiveness in a variety of settings. Feedback interventions have increased productivity in a university admissions department (Wilk & Redmon, 1990), and in a family-style restaurant (Johnson & Masotti, 1990). PM interventions also have been implemented to increase adherence to safety programs in industrial settings (Komaki, Heinzmann, & Lawson, 1980; Sulzer-Azaroff, Loafman, Merante, & Hlavacek, 1990), and have served as the basis for research on monetary incentives (Frisch & Dickinson, 1990).

Current research in PM suggests that the quality and quantity of outputs resulting from performance may be improved simultaneously. Researchers in one study applied a performance feedback strategy in a small metal-part processing company. The results indicated that the feedback program improved the percentage of components completed by machine operators for a Statistical Process Control quality program (Henry & Redmon, 1990). In another study, written and verbal feedback
improved the average weekly set-up time for machines in the extrusion department for a rubber manufacturing company (Wittkopp, Rowan, & Poling 1990). This research suggests that performance improved due to the reinforcing effects of praise from supervisors where interaction with a supervisor was crucial to maintaining the desired performance.

Although previous research has shown that supervisor feedback is an effective means of performance management (Balcazar, Hopkins, & Suarez, 1986), in most work situations employees spend little time interacting with their supervisors. Employees often report that they do not know what their supervisors expect them to do. Even when they are told what to do, they may rarely interact with a supervisor while they are engaging in a particular task. They must rely on past experiences, or their own judgment, to determine if they are performing within expected standards. As a result, they may lose interest in particular tasks, or put off doing tedious, boring tasks. Numerous research studies have examined the effects of performance antecedents and performance consequences on employee behavior (Balcazar et al., 1986; Sanford, Thomason, & Gerald, 1989). But only a few studies have considered the effects of monitoring performance as it occurs (Komaki, 1986; Komaki, Desselles, & Schepman, 1988). Current evidence suggests that performance can be positively affected if managers actively talk to employees about their performance as well as monitor employee performance at different points in the day, even if no specific feedback is given (Larson & Callahan, 1990). If these results hold true, a low cost means of effective supervision could be developed using monitoring alone.

The gathering of information about an employee’s performance by means of verbal report, direct observation, or inspecting work output is referred to as performance monitoring (Larson & Callahan, 1990). Performance monitoring has been
identified as a critical component in an operant-based model of effective supervision (Komaki & Desselles, in press). A taxonomy of supervisory behavior developed by Komaki, Zlotnick, and Jensen (1986) includes performance monitoring as an important supervisory behavior. These authors considered a supervisor's influence on the performance of their employees in accomplishing work-related goals to be a critical role of a good leader. This taxonomy consists of seven categories of supervisory behavior, the first three of which are derived from operant conditioning. The categories are: (1) performance consequences, (2) performance monitoring, (3) performance antecedents, (4) own performance, (5) work related, (6) non-work related, and (7) solitary. Table 1 presents the major categories of the taxonomy, including definitions and examples of each. Research on the taxonomy has focused on antecedents, consequences and monitoring. Of these three, monitoring has been determined to be the most important (Komaki, 1986). Komaki (1986) identified three methods of monitoring by a supervisor: work sampling, self-report, and secondary source. Work sampling consists of, "direct observation, inspection of or listening to another's work for at least 9 out of 10 seconds" (p. 279). Self-report involves a supervisor asking an employee about performance, while secondary source implies the gathering of information about an employee's work through someone else.

Evidence confirming the importance of monitoring has been found in three field studies. One study, conducted in a medical insurance firm, suggested that effective managers spent significantly more time monitoring performance than marginally effective managers (Komaki, 1986). Using the Operant Supervisory Taxonomy and Index, experimenters observed and categorized the behaviors of two groups of managers. They found that effective managers used a particular type of performance monitoring, work sampling (i.e., inspecting the work itself when interacting with
employees). In addition, these researchers tested the effects of the sign—positive, negative, or neutral—of the consequences provided. They found no differences in the percentage of intervals spent providing positive, negative or neutral consequences by effective and marginal groups of managers.

Table 1
Definitions and Examples of Categories of the Operant Taxonomy of Supervisory Behavior

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Consequences</td>
<td>Indicates knowledge of performance.</td>
<td>&quot;You really have a knack for this!&quot;</td>
</tr>
<tr>
<td>Performance Monitoring</td>
<td>Collects information about a person's performance.</td>
<td>&quot;I just wondered how your work was going.&quot;</td>
</tr>
<tr>
<td>Performance Antecedent</td>
<td>Instructs, reminds or conveys an experience of performance.</td>
<td>&quot;Please be here a little early.&quot;</td>
</tr>
<tr>
<td>Own Performance</td>
<td>Refers to his or her own performance.</td>
<td>&quot;I'm figuring out the details on that account.&quot;</td>
</tr>
<tr>
<td>Work Related</td>
<td>Refers to work but not to subordinate performance.</td>
<td>&quot;According to the records, we are still grossing more than year.&quot;</td>
</tr>
<tr>
<td>Nonwork Related</td>
<td>Does not refer to work issues or concerns</td>
<td>&quot;Did you catch the game on TV last night?&quot;</td>
</tr>
<tr>
<td>Solitary Activity</td>
<td>Not oriented towards or attending to other individuals</td>
<td>Doing paperwork at desk. Opening daily mail. Walking to the copy machine.</td>
</tr>
</tbody>
</table>

Research conducted on a construction site in Finland also demonstrated that supervisors considered to be effective spent significantly more time monitoring performance (J. Komaki, personal communication, March 3, 1991). And similar results were found in a study conducted during a sailboat racing competition; winning
skippers were more likely to spend time monitoring performance than losing skippers (Komaki, Desselles, & Bowman, 1989). In this study, an expanded model of effective supervision involving monitoring and consequences for performance was tested in a competitive setting. The components of the empirically-based operant model were extended to tasks requiring the integration of team efforts. It was determined that leaders who finished ahead of their peers were more likely to oversee subordinates’ efforts and let their crews know when they were doing things right or wrong. In particular, these leading skippers were more likely to monitor performance and provide consequences during the actual race.

The behavior of subordinates also has been studied from a performance monitoring perspective. Larson and Callahan (1990) assessed the effects of performance monitoring on worker productivity in a laboratory setting. These researchers found that monitoring alone improved performance in that the amount of work completed on experimental tasks increased significantly when performance on those tasks was monitored. Also, it was found that there was a further increase in the amount of work completed when monitoring was followed by performance-contingent consequences. One explanation of these results maintains that performance monitoring enhances managerial effectiveness because it strengthens the relationship between subordinate work performance and the consequences delivered by managers (Komaki, 1986). However, Larson and Callahan postulated that supervisors’ monitoring activity might serve as a cue to signal the relative importance of various tasks resulting in more effort put into tasks that are being monitored. This view assumes that the effect of monitoring on the subject’s task performance may be explained by the influence of the perceived importance of the monitored task.
The above findings raise a critical question: Is monitoring alone sufficient to influence performance or are contingent consequences necessary? The findings of Larson and Callahan (1991) showed that the addition of contingent consequences enhanced performance over and above the effects of monitoring alone. However, the work of Komaki and colleagues found that marginal and effective managers differed in their use of monitoring, but not in their use of consequences.

A second question also is suggested by the research above: What makes performance monitoring effective? According to Komaki (1991) it is possible that monitoring sets into motion a dialogue between the superior and the subordinate. That is, the subordinate would be more likely to talk about his or her own performance, and the superior would be more likely to talk, in turn, about the subordinate’s performance. Also, monitoring may set into motion content-specific discussions related to performance (i.e., discussions that revolve around what the subordinate had done with respect to the task).

The purpose of the present study was to: (a) test the effectiveness of performance monitoring on performance, and (b) compare the effects of performance monitoring with the effects of performance contingent consequences. Additionally, measures of the effects of monitoring on supervisor-employee interaction patterns were taken to determine possible explanations for the effectiveness of performance monitoring.

Subjects performing a paper-and-pencil, simulated quality control work task were managed by a trained student supervisor. The selection of a quality control task allowed for an inexpensive method of administration for the task, while providing a basis for further research in the area of quality control. The paper-and-pencil method used was designed to simulate processes carried out by product producing companies.
Concern for accurate quality control performance has increased in the past decade due to expectations of consumers, international competition and legal demands (Gallway & Drury, 1986). Defect-free products can only be achieved by 100% inspection, which is often not achieved by human inspectors. To solve this dilemma, many companies are utilizing microprocessor-based, optically sophisticated inspection devices to inspect metal products, textile fabrics, nuclear power fuel elements, and coal on a processing conveyor. However, some items in manufacturing settings must be evaluated without a numerical measurement. As a result human visual inspection is still necessary in most operations (Drury & Sinclair, 1983).
CHAPTER II

METHOD

Subjects and Setting

Six subjects were recruited from undergraduate classes to serve as quality control inspectors. At the end of the study, subjects were paid $10 for each week they participated in the study. As an added incentive, subjects were informed that any person who had perfect attendance for all sessions would be paid an additional $10. One undergraduate research assistant and one graduate research assistant served as supervisors for the study. The proposal was approved under the exempt category by the Human Subjects Institutional Review Board. (See Appendix B for the approval letter.)

Inspection Task

Four figures were used in the inspection task (See Figure 1): (1) a square with eight dots placed equidistant on the perimeter line, (2) a hollow arrow figure, (3) a perpendicular line figure, and (4) an arrow constructed of gradient lines. Each figure had three possible incorrect forms (See Figure 1).

Errors for the square figure consisted of the following: (a) an imperfect perimeter line, (b) dots not equidistant, or (c) wrong number of dots. Errors for the hollow arrow consisted of the following: (a) incorrect arrow direction, (b) incorrect arrow shape, or (c) arrow not completely hollow. Errors for the perpendicular line figure consisted of the following: (a) entire figure pointed left, (b) absence of a right
Figure 1. Sample Quality Inspection Task Sheet.
angle, or (c) a 90-degree rotation of the figure. Errors for the arrow constructed of gradient lines consisted of the following: (a) part of the arrow missing, (b) incorrect arrow direction, or (c) a 180-degree rotation of the figure.

The inspection task was a paper-and-pencil task selected because of its similarity to a number of visual inspection tasks involving quality control. Another benefit of the task was its neutrality with respect to subject history, and its ease of training. In addition, attributes of specific stimuli were easy to identify, and the cost of administration was low.

Dependent Variables

Accuracy and Rate of Inspection

Subjects were trained to identify incorrect figure forms on 8 1/2 x 11 sheets of paper consisting of sequences of incorrect and correct figures (see Figure 1). Incorrect figures were defined as those containing any deviations from the correct configurations based on stated criteria, and errors were limited to those described in Figure 2. During each session, subjects were instructed to identify errors by marking incorrect figures on twenty sheets of paper (80 figures per page). The incorrect figure forms were located randomly on each page of figures. The percentage of incorrect figures per session was 10 percent across all pages in each session.

Measures of accuracy and rate of work were collected. Accuracy was assessed by scoring two types of errors: (1) omissions (failure to identify an error), and (2) commissions (identification of a figure as containing an error when none was present). Rate was measured by calculating the number of correctly identified figures for each session and dividing this number by the number of minutes required for task completion.
Figure 2. Correct and Incorrect Forms of Figures.
Inspection performances were scored by the researcher who examined the sheets of figures for errors using a template designed to overlay pre-constructed inspection sheets. Interobserver agreement was assessed by having a second, independent observer score 25% of the task sheets. Percentage of agreement was computed as follows:

\[
\frac{\# \text{ agreements}}{\# \text{ agreements} + \# \text{ disagreements}} \times 100
\]

An agreement occurred when both observers scored an item marked by a subject as either correct or incorrect. A disagreement occurred when an item marked by a subject was scored differently by the two observers.

**Supervisor-Subject Interactions**

During supervision conditions, the supervisor carried a pocket tape recorder in order to record interactions with subjects. The researcher listened to these recorded verbal interactions and coded the responses of subjects in one of three categories: (1) general comment, (2) work-related comment, or (3) work-related question. General comments included any subject vocalization not related to the work task made in response to a comment made by the supervisor. Examples included, “Fine,” “Good,” or “Okay.” Work-related comments included any vocalization made by the subject that referred to the inspection task. Examples included, “I think I keep missing the same figure,” or “This is tough!” Work-related questions included any questions asked by subjects about work, for example, “Do you think I am doing this right?”

All tapes were reviewed by a trained observer and all subject verbalizations were coded according to the three categories. A second researcher listened to, and coded 25% of the recorded interactions. Interobserver agreement was assessed by
reviewing the codes assigned by the two observers for agreements and disagreements and calculating the percentage of agreements using the same formula as above.

**Inspection Training**

During training, subjects received a folder of training materials consisting of one sheet of general instructions and one sheet describing each of the four stimuli which made up the inspection task. The general instructions included an explanation of the purpose of the task, a statement of the importance of accurately identifying correct and incorrect samples, and a statement of the importance of working as quickly and accurately as possible. In addition, subjects were told that questions would not be answered by the researcher, and that no collaboration or discussion should occur during training.

The task sheets used for training contained correct versions of each of the four figures, and three types of incorrect examples for each figure (See Figure 3). Detailed instructions for detection of errors were provided for each figure. For example, for the square figure, subjects were told, “This is the correct form of the square figure. Three features of this figure can be incorrect. The dots on the perimeter may be too far apart, there may be too many dots, or the perimeter line may not be complete. If you detect any one of these incorrect features on the following sheets, place an ‘x’ on top of that figure.” A similar dialogue followed for each of the other three figures.

After the main features of each figure had been reviewed, a test was administered to assess subject competence. Four pages were included in the test, one page for each type of figure. Each page consisted of ten figures and each subject was required to identify errors on the page by marking an “x” over these figures. Once 90%
accuracy had been achieved on the tests for all figures, subjects were allowed to proceed to the inspection task phase.

PERPENDICULAR LINE FIGURE \[\begin{array}{c}
\text{Possible incorrect features:} \\
\text{Direction} \\
\begin{array}{cc}
\bot & \top \\
\end{array} \\
\text{Not a right angle} \\
\begin{array}{cc}
\bot & \bot \\
\end{array} \\
\text{Incorrect line length} \\
\begin{array}{cc}
\bot & \bot \\
\end{array}
\end{array}\] (CORRECT FORM)

The correct form of the figure is shown at the top. Three features of this figure may be incorrect. If you detect any of these incorrect features, place an "X" on top of that figure.

Figure 3. Sample Training Sheet.

Independent Variable and Design

Treatment Manipulations

Two treatments were examined: monitoring-only, and monitoring-plus-feedback. A multiple-baseline-across-subjects design was employed, where
A=baseline, B=monitoring-only, and C=monitoring-plus-feedback. The six subjects were divided into three pairs, and the conditions were applied in staggered fashion across the three pairs. For each condition, data on each pair of subjects were collected until no trend was discernible in the data points.

Monitoring-only was defined as a supervisor collecting information about an employee’s work by direct inspection for at least three seconds, and asking about the work. The interaction included questions about the work that the employee was doing. An example was: “How is your inspection task going today?” At the beginning of performance monitoring sessions, subjects were told, “I will come into the room in about five minutes to check on your progress.”

Monitoring-plus-feedback included evaluative feedback given after the monitoring, contingent upon work performance. In this condition, a supervisor evaluated employee performance by communicating approval or disapproval of work in terms of predetermined performance standards. An example of a positive evaluation was: “Great! You didn’t make any errors on this page today!” An example of a negative evaluation was, “Your accuracy is decreasing. You made two errors on this page.” Subjects in this condition were told, “When you see the word ‘stop’ at the bottom of the page, let me know and I will come into the room to grade one of the pages you have completed.”

Performance was evaluated by the supervisor in terms of accuracy based on comparisons with baseline performance. For each feedback episode, supervisors graded one completed task sheet selected at random, and provided feedback regarding errors made. If an error was made, the supervisor indicated this and asked the worker to pay closer attention to the task. If no error was found, the supervisor indicated that the work was going well and that the worker should keep up the good performance.
Supervisor Training

One psychology graduate student and one undergraduate student served as supervisors. To prepare for the monitoring-only condition, supervisors were provided with written examples of performance monitoring and were required to practice monitoring through role-play performance monitoring situations with the researcher. For the monitoring-plus-feedback condition, supervisors were trained to provide consequences contingent upon employee behavior. The researcher provided examples of contingent consequences and demonstrated situations to the supervisors where contingent consequences were to be provided. Finally, the researcher and a student assistant acted out a series of work situations and the supervisor trainee was asked to identify whether the type of supervision in each situation was performance monitoring or performance monitoring plus contingent consequences. Once supervisors were able to correctly identify three sample situations without error, they were permitted to begin supervising subjects involved in the study. One supervisor interacted with the subjects for 80% of the sessions. The other supervisor interacted with the subjects for 20% of the sessions. Supervisory assignments were distributed across sessions in a random fashion.

Procedures

During each baseline session, subjects were instructed to complete a packet of task sheets consisting of 20 pages with 80 figures on each page. They were instructed to put an “x” over each of the defective figures on each sheet and to work at their own pace. Beginning and ending times were recorded. A second observer recorded times for 25% of the sessions. The following instructions were read aloud to each subject:
In your packet you will find 20 pages of figures. Some of them contain errors like you saw in the training session. Your goal is to identify the figures which contain errors by marking each defective figure with an ‘x.’ There is no time limit on the task. You may take as long as you like.

During the performance monitoring phase, the instructions were the same as for baseline except for one addition. They were told, “A supervisor will come into the room in five minutes or so to check your progress.” When subjects had been working for five minutes, the supervisor monitored their work by asking them about progress.

During the performance monitoring-plus-feedback condition, the instructions were the same as in the baseline condition, with one exception; subjects were told, “When you reach the page that says ‘stop,’ indicate that you are ready, and a supervisor will come into the room to grade a page and to evaluate your performance.” When subjects indicated that they had reached the stopping point, the supervisor went into the room, turned on the tape recorder, stopped the timer, and graded a page that was previously selected at random. When the supervisor had finished grading the page, she showed the subject which items were incorrect, provided an evaluative statement, and waited for a response from the subject. If a subject did not respond within three seconds, the supervisor turned the timer back on and instructed the subject to continue working.

Satisfaction

At the end of the study, subjects were asked to complete a questionnaire to determine their level of satisfaction during each of the conditions (See Table 2). In addition, answers to the questionnaire provided information about rules subjects may have developed while working on the task.
Table 2
Percent of Supervisor/Subject Interactions For Each Coded Category

<table>
<thead>
<tr>
<th>Subject</th>
<th>Phase</th>
<th>Percent of “A” Responses</th>
<th>Percent of “B” Responses</th>
<th>Percent of “C” Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>M+F</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>83</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>M+F</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>M+F</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>M+F</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>M+F</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>75</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

*Legend. A = General Comment, B = Work-Related Comment, C = Work-Related, M = Monitoring Only, M+F = Monitoring-Plus-Feedback*
CHAPTER III

RESULTS

Interobserver Agreement

Overall interobserver agreement was 99% for omissions and commissions. Interobserver agreement was 100% for tape recorded interaction coding, and 100% for times recorded on stopwatches.

Differences in performance were analyzed by visual inspection of graphed data. Data were analyzed both within and between subjects. All subjects completed all sessions. Five subjects met the criterion for testing during training. Subject 6 had to repeat the training test for one figure in order to meet the criterion.

Table 3 shows the means and standard deviations for each dependent variable, (omissions, commissions, and number of correct figures completed per minute). Means and standard deviations were calculated for each subject per session across phases.

Table 3
Means and Standard Deviations for Independent Variables

<table>
<thead>
<tr>
<th>Subject</th>
<th>Pair</th>
<th>Phase</th>
<th>Omissions Mean</th>
<th>SD</th>
<th>Commissions Mean</th>
<th>SD</th>
<th>Correct/Minute Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>9.60</td>
<td>2.07</td>
<td>0.00</td>
<td>0.00</td>
<td>85.19</td>
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Note. Phase 1= Baseline, Phase 2= Performance Monitoring, Phase 3= Feedback.

Omissions

Figure 4 presents the number of omissions each subject made for each session. An omission occurred when a subject failed to correctly identify figures containing errors. Data were inconsistent for the monitoring-only condition; subject 1 made more omissions during this condition relative to baseline. Subject 2 decreased omissions as
compared to the baseline condition. The other four subjects made about the same number of omissions in the monitoring-only condition as during baseline.

For the monitoring-plus-feedback condition, four subjects made fewer omissions than they had during the monitoring-only condition. Subjects 4 and 5 made about the same number of omissions in this condition as in monitoring-only.

Commissions

Figure 4 also illustrates the number of commissions made by each subject for each condition. Commissions, or false alarms included instances where subjects identified a figure as incorrect when, in fact, there was no error for that figure. Commissions rarely occurred during baseline, or the monitoring-only condition. However, subjects 3 and 6 made more commissions during the monitoring-plus-feedback condition.

Rate and Quality

Figure 5 shows the number of figures identified correctly per minute for each subject across conditions. Subjects maintained the same rate during the monitoring-only condition as during baseline. As rate increased errors increased so that the number of figures correctly identified per minute stayed the same. Subject 1 increased rate during the monitoring-plus-feedback condition. The other five subjects maintained about the same levels of rate and quality for the monitoring-plus-feedback condition as during monitoring-only.
Figure 4. Number of Errors Per Session for Each Condition.
Figure 5. Number of Figures Identified Correctly Per Minute.
Verbal Interactions

During monitoring-only and monitoring-plus-feedback conditions, subjects had the opportunity to talk to a supervisor. Interactions were coded as, A= General comment, B= Work related comment, and C= Work related question. Table 2 depicts the percentage of occurrences of each type of interaction for each subject across conditions. For four subjects, all responses fell into the “A” category during the monitoring-only condition. Subjects 2 and 6 made comments that fell into the “B” category during the monitoring-only condition. During monitoring-plus-feedback, Subjects 5, and 6 made comments that fell into the “B” category, and Subject 6 made a comment that fell into the “C” category.

Satisfaction

Purpose of the Study

Subjects 1, 2 and 5 said that they thought the purpose of the study was to determine the effectiveness of different types of supervision on performance. Subjects 3 and 4 reported that the purpose of the study was to see how well people can pick out defective items.

Type of Supervision

Five subjects reported that they preferred supervision which included monitoring plus feedback. Subject 6 said that she preferred no interruptions.

Rules

All subjects reported using rules to guide their responses while inspecting sheets for errors. Subjects 2, 3, and 5 checked for errors by looking at one symbol at a
time. The other three subjects reported that it was easiest to look at parts of a page while looking for errors.

**Emotional Effects**

Subject 2 reported that it was frustrating to receive feedback on omissions because she wanted to have a perfect record. Subject 6 reported feeling frustrated when she had not had enough sleep and could not focus on the figures.

**Payment**

All subjects reported that payment was an effective incentive for participation. Subjects 1, 2, and 4 also added that regardless of payment, they always finish a project that they begin. Subject 6 said that the payment agreement ($10 for every three sessions completed) kept her from missing sessions.
CHAPTER IV

DISCUSSION

The results of this study provide evidence that supervisor feedback and monitoring of performance can be used effectively to increase productivity of employees who perform quality control inspection tasks. The results of this study also indicate that supervisor monitoring of performance without feedback does not improve performance on quality control tasks. In addition, results of the social validation questionnaire indicated that most subjects preferred supervisor feedback over monitoring-only or no interaction with supervisors.

Rate of task completion also was assessed, and these results indicate that subjects decreased the amount of time required to complete the task, while decreasing number of errors made. When rate became stable, further decreases in time to completion tended to increase error rate. Supervisor interaction did not appear to be related to time to completion.

Previous studies have assessed the effects of performance monitoring in applied settings (Komaki, 1986; Komaki et al., 1986, 1989). These researchers suggest that managers who monitor performance are more likely to be effective, and that monitoring of performance alone is effective in improving employee performance. Previous research in a laboratory setting also indicates that monitoring of performance alone improves employee performance to some extent (Larson & Callahan, 1990). The findings of this study are not consistent with this research in that monitoring-alone did not lead to consistent performance improvements across subjects relative to baseline conditions.
Komaki (1986) suggests that monitoring is successful in improving performance because it provides an opportunity for subjects to talk to supervisors about their work. Data for the present study indicate that subjects did not discuss their work with supervisors during the monitoring-only condition. Subject 2 made one comment about her work during monitoring, but error rate did not improve for that session or for the sessions following.

Larson and Callahan (1990) suggest that performance may be monitored by observing employees' behavior, inspecting work output, or asking employees to report on their progress. Komaki (1986) identifies three methods of monitoring: work sampling, self-report and secondary source. It is possible that the type of monitoring utilized in the present study, asking subjects about their work (self-report), was not sufficient to improve employee performance. Inspection of work directly may serve as a more powerful source of influence than a verbal exchange. Follow-up research is needed to assess the effects of monitoring performance by inspecting work output (work sampling), and then providing performance contingent consequences for the same task during a monitoring-plus-feedback condition.

Several problems with the present study should be noted. The first four data points for the baseline condition were collected while subjects participated in a previous study using the same task. It is important to note that subjects were working on the task in groups of three for these four sessions, and were paid $30 upon completion of the fourth session. Extreme changes in the number of omissions made during session four may have been due to the fact that it was the last day of the first study, and that payment was to follow, or due to the social effects of working with others. Subjects working in groups tended to complete the task at the same time, indicating that the presence of
other subjects affected rate and perhaps quality of work. During the present study (after session 4) subjects worked in private rooms.

For the monitoring-plus-feedback condition, the number of omissions made decreased relative to monitoring-only for four subjects. However, Subjects 4 and 6 maintained the same levels of omissions during monitoring-plus-feedback. A possible explanation for the lack of reduction in errors for these subjects could be that performance had reached a lower limit and could not improve any more. A solution to this problem could entail reconstructing the inspection task by making figures smaller, more sporadically distributed, and errors more difficult to detect. For example, figures could be made more complex by including small letters of the alphabet arranged in various patterns.

Another possible explanation for lack of improvement in performance during monitoring-plus-feedback is fatigue. Four subjects finished the inspection sessions during the last week of classes. The other two subjects finished sessions during final exam week. Some subjects complained of lack of sleep, and inability to focus. Finally, data collection for the last two subjects could have been extended to provide more accurate results. Data collected for the first four subjects suggest that the effects of performance contingent consequences provided during the monitoring-plus-feedback condition required several sessions to become evident. The short phases for the last two subjects were due to restrictions in time and may have obscured positive effects.

Training also may have affected the number of omissions made by subjects. Subject 6 had to repeat the training quiz for the gradient line figure. While the number of omissions she made was consistently higher than any other subject, she did not have an opportunity to interact with the supervisor until the eighteenth session. Still, she did not comment about her work until the final session. When the supervisor graded one
of the pages in her task booklet during the final session, she asked what was wrong with one of her omissions, a gradient line figure with an elongated stem. She reported that she did not know that an elongated stem was an error. Early intervention may have improved her omission rate significantly.

All subjects maintained a stable number of commissions for baseline and monitoring-only conditions; however, for two subjects the number of commissions increased during monitoring-plus-feedback. Some of the quality control literature explains errors by referring to the rules which subjects develop when working on a task (Thorne, 1991). Subjects with high rates of commissions or false alarms are said to develop strict criteria for task completion. Since commissions did not increase until the monitoring-plus-feedback condition, it is possible that these subjects were inspecting figures more closely than during previous conditions. As a result, more commissions, or false alarms might have occurred.

Finally, the external validity of the present study should be considered. Supervisors were research assistants and the subject’s history with these supervisors was limited to the interaction during the two studies in which they participated. Follow-up research could alter the relationship between the subject and supervisor by making continuation in the study contingent upon good performance. Subjects could still be paid $10 for each week of participation; however, a specified level of performance could be required for subsequent participation. This type of set-up may be more realistic since many persons’ jobs are contingent upon performance.

In summary, the results of the present study suggest that performance contingent feedback is superior to monitoring alone as a means of influencing worker performance. However, the intervention used only one type of monitoring. It is
possible that other types of monitoring, which are less intensive than performance-contingent feedback, might be useful. This should be the subject of future research.
APPENDICES
Appendix A

Informed Consent Form
Informed Consent

The purpose of this study is to investigate the effectiveness of different types of training on inspector accuracy. Participants will be trained to locate errors in an inspection task. The task is designed to resemble quality control inspections that routinely occur in manufacturing settings. All verbal interactions between you and the researcher will be tape recorded. Tapes will be marked with a unique code for each subject and will be kept in a locked drawer. Within 48 hours after the tapes have been analyzed, the code numbers will be removed from the tapes and they will be stored as anonymous data for one year.

Your identity will remain confidential and your name will not be attached to data collected as part of the study. The task does not include a test of intelligence or abilities. The figures were created for studies of this type and are designed to test only inspector accuracy.

Your participation will require a maximum of 18 sessions (about thirty minutes each, three times a week) during a six-week period. At the end of the study, you will be paid $10 for every three sessions you attended. If your attendance is perfect for all scheduled sessions throughout the study you will be paid an additional $10. The maximum amount that you can earn is $70. If you drop out of the study you will not receive payment. All sessions will be held on campus in university buildings and will be scheduled at times convenient to you.

The risks to you as a result of participation in this study are minimal. Your participation is strictly voluntary. You may choose not to participate or to withdraw at any time during the project. However, please remember that no payment will be made unless you complete the study. Your decision to participate or to withdraw at any time will in no way affect your status as a student at Western Michigan University.

If you have questions now or at anytime, you may contact Julie Glasser at 349-3484 or William Redmon (Faculty Advisor) at 387-4485.

Your signature indicates that you have read and understood the above information and that you agree to participate in this study.

---------------------------------------------------------------
signature

---------------------------------------------------------------
date

---------------------------------------------------------------
signature (researcher)

---------------------------------------------------------------
date
Appendix B

Approval Letter From the Human Subjects Institutional Review Board
Date: March 20, 1992
To: Julie Glasser
From: Mary Anne Bunda, Chair
Re: HSIRB Project Number: 91-08-14

This letter will serve as confirmation that your research protocol, "The differential effects of performance monitoring and performance feedback" has been approved under the exempt category of review by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application.

You must seek reapproval for any changes in this design. You must also seek reapproval if the project extends beyond the termination date.

The Board wishes you success in the pursuit of your research goals.

xc: Redmon, Psychology

Approval Termination: March 20, 1993
BIBLIOGRAPHY


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