

Electronic Performance Monitoring and Stress: The Role of Feedback and Goal Setting

John R. Aiello and Yang Shao

Psychology Department, Rutgers - The State University, New Brunswick, NJ, USA

1. Introduction: Electronic Performance Monitoring

Performance monitoring refers to supervisors' gathering of information about the work effectiveness of employees. It is an integral part of effective management because it enables management to keep track of employees' productivity level. Performance monitoring is important for two reasons. First, it serves as a basis for other important management actions. For example, based on monitoring information, supervisors are able to provide feedback to employees, diagnose performance problems, reward good performers and set goals for future performance (Grant, Higgins, & Irving, 1988; Sherizen, 1986). Performance monitoring also affects employee behavior in that it often functions as a social cue of management intent, signaling employees as to which work activities are more important and which are not. As a result, employees are more likely to focus on those activities that are monitored (Larson & Callahan, 1990). Field studies have found that effective managers often engage in more frequent monitoring activities than ineffective ones (Komaki, 1986).

Technological developments have brought about numerous changes in the manner in which managers do their jobs. Performance monitoring is no exception. Electronic work monitoring refers to the computerized collection of employee performance information. Electronic monitoring has become popular largely due to the rapid computerization of the modern workplace and development of computer network technology. With the proper software, managers now are able to unobtrusively determine each individual employee's work pace, performance accuracy and the amount of time spent on work or non-work related activities. According to an estimation by the Office of Technology Assessment, in 1987 there were six million American workers whose work was monitored and evaluated by electronic monitoring systems (U.S. Congress, Office of Technology Assessment, 1987). By 1990, the number increased to over ten million employees nationwide (9 to 5, 1990).

Computer monitoring differs from traditional monitoring in the scope and content of the monitoring. In traditional performance monitoring, managers were only able to spend a small amount of their time engaging in monitoring activities. Computer monitoring, however, is capable of recording employee activities in a continuous fashion. Even though managers may not spend all of their time sitting in front of a computer terminal watching employees working, to the monitored employees monitoring is taking place constantly. While the focus of traditional monitoring was on productivity or employees' work product, the new capacity of electronic monitoring has changed this to include a focus on the work process and even non-work activities (e.g., bathroom breaks). These two differences have made computer monitoring different from traditional monitoring in a fundamental way.

Computer monitoring has been a controversial issue since the day it was introduced (cf. Aiello, 1993). Management and labor have typically been on opposite sides of the debate.

Employers have, for the most part, welcomed computer monitoring. They have viewed computer monitoring as an opportunity to facilitate other management activities to boost productivity.

Feedback has been considered by many to be the most significant advantage of computer monitoring. Computers can provide accurate and up to the minute information about an employee's performance. This enables supervisors to provide objective, timely and more frequent feedback to employees. Managers can also set goals with employees more easily and reinforce goal attainment more effectively. Many also believe that computer monitoring can motivate employees to work harder and become more responsible for their work, since any "slackening" could be quickly detected.

Computer monitoring has been resented by many employees and labor organizations however. They have argued that: computer monitoring is an intrusion into worker privacy; it represents a lack of trust toward employees; and it often leads to excessive control and work pacing by management. They argue that the combination of these factors have led to elevated employee stress levels, lowered job satisfaction, and long-term negative health outcomes (e.g., 9 to 5, 1990).

As is often the case with new technologies, our understandings of computer monitoring has lagged behind its applications. Despite the increasing number of employees who are monitored by computers and the heated debate about its merits, few empirical studies have been conducted to systematically investigate this complex and important issue. Most of the early studies have taken the form of case studies, employee surveys and interviews. Results of these studies revealed that computer monitoring often leads to increased stress, decreased satisfaction and a decline in the quality of management/labor relations. It has also been reported that employees whose work is monitored by computers perceive a greater emphasis on work quantity rather than work quality (e.g., Irving, Higgins, & Safayeni, 1986).

To bridge the gap in empirical studies of electronic monitoring, we conducted a series of experimental studies involving more than one thousand participants to systematically investigate the effects of computer monitoring on worker reactions and performance. In these studies, we have also examined other issues that are thought to be closely related to the use of computer monitoring. The major questions that we asked throughout these studies were: What impact does computer monitoring have on the stress and satisfaction experienced by those who are monitored? Is computer monitoring effective in improving performance? Is computer monitoring coupled with feedback effective in boosting performance? What are the results of combining monitoring, feedback and different goal levels on performance? What theoretical framework can be used to best explain the effects of computer monitoring? How does monitoring interact with other organizational characteristics, e.g., task climate? We will summarize our findings pertaining to each of these questions.

Following two initial field investigations (cf., Aiello, 1993), our subsequent studies were laboratory studies using university students as subjects. The typical work setting is a computer lab equipped with networked PCs. Each subject works at his/her own terminal. Under monitoring conditions, subjects were told that their performance would be monitored by their supervisor via a central or "master" computer. In the non monitoring conditions, no central computer or networking of the computers was mentioned.

2. Effects of Computer Monitoring on Stress

All six of our studies directly examined subjects' self-reported stress-related responses (see Table 1). Results of these studies consistently demonstrated that computer monitoring is

associated with increased stress. In studies 2, 3 and 4, subjects under the computer monitored conditions reported significantly higher levels of stress compared to those who were not monitored. In study 5, we manipulated feedback (positive or negative feedback, group or individual feedback) in conjunction with computer monitoring. Data showed that regardless of the kind of feedback subjects received, subjects who were electronically monitored felt more pressure from the supervisor than those who were not monitored.

The results of study 1 and study 6 showed some interesting moderating effects of other individual and organizational variables on the monitoring/stress relationship. In study 1, we measured subjects' locus of control and found that subjects who were more external in their locus of control (that is, individuals who believe that reinforcements they receive are primarily determined by factors outside of themselves) reported higher levels of stress under the monitoring conditions. Thus, we are reminded that there are individual differences in responses to computer monitoring. This study also demonstrated that perceptions of control over monitoring affect the degree to which stress is experienced. When monitoring occurs at the individual level, it leads to higher stress than when monitoring is performed at the group level. Results of study 6 (as in study 4) supported this pattern of results. In both studies, subjects who were individually monitored felt the most pressure, while those who were monitored at a group level reported less stress.

These results are consistent with the findings reported by researchers using different measures of stress and in different settings. For example, Schleifer and his colleagues used physiological measures of mood and found that computer monitoring caused mood disturbances and musculoskeletal discomfort among those who were working on a VDT data entry task (Schleifer, Galinsky & Pan, 1992). In a field study, Smith and his associates surveyed telecommunications workers and found that monitoring was associated with high levels of tension, anxiety, depression, anger and fatigue (Smith, Carayon, Rogers & LeGrande, 1990).

We also examined subjects' reactions toward the task and their supervisor under different monitoring conditions. Two of our studies (studies 3 & 4) reported that subjects exposed to computer monitoring expressed a more negative view toward their supervisor and the task.

3. Effects of computer monitoring on task performance

While the relationship between computer monitoring and stress is relatively clear, the association between monitoring and task performance is less well-established. Despite the belief by many computer monitoring advocates that monitoring will improve worker productivity, the results from our studies are mixed. We have found that the effects of computer monitoring on task performance are strongly affected by the nature of the task, especially task complexity. In general, when the task is simple and repetitive, e.g., data entry, computer monitoring improves performance level. If the task is the least bit complex (i.e., requires much thought), computer monitoring lowers performance level. This pattern is clearly evident in four of our studies. For example, in two of the studies (studies 4 & 5) using a simple data entry task, computer monitoring led to enhanced performance. In contrast, in the two studies that used a complex anagram task (studies 1 & 3), computer monitoring led to lower levels of performance.

The differential effects of computer monitoring on simple vs. complex task performance can best be explained using a social facilitation framework. Social facilitation posits that in the presence of an audience or coactors, complex task performance will decline and simple task performance will improve (Zajonc, 1965). Our work has demonstrated that computer monitoring establishes a situation in which there is a constant remote audience, which

facilitates simple task performance and impairs complex task performance (Aiello, 1993; Aiello, Shao, Chomak & Kolb, 1993).

While the majority of the workers currently subject to computer monitoring perform repetitive, clerical tasks, there is an increasing number of professionals (engineers, managerial personnel) whose work is being monitored by computers (US Congress, Office of Technology Assessment, 1987). Our findings suggest that employers should either not use computer monitoring with these employees or, at least, take extra precautions when the monitored task is even moderately intellectually demanding.

4. Computer monitoring, feedback, and goal setting

One of the most important potential advantages of computer monitoring is its capacity to provide accurate and timely feedback about employee performance. It is generally believed that more frequent feedback can lead to improvements in productivity. Research in the feedback area, however, does not uphold this belief. Studies of feedback have found mixed results concerning its effects on task performance (Ilgen, Fisher & Taylor, 1979). Feedback serves both learning and motivational functions. The learning effects associated with frequent feedback are clearly beneficial. Positive results, for example, have been reported when computer monitoring was used to facilitate the training of new customer service employees (Laabs, 1992). The motivational effects of feedback are less direct and less clear. In fact, research has demonstrated that feedback is a necessary, but not a sufficient, condition for performance improvements (Erez, 1977; Locke & Bryan, 1968). Feedback is a necessary condition for performance improvement because it allows an individual to compare his/her current standing with a standard and make adjustments in effort or strategy to achieve the desired outcome (Erez, 1977). However, without a standard, or a goal, feedback by itself may just be a meaningless number and have no effect on task motivation and performance. Studies have found that when goal setting in response to feedback was prevented or controlled, there was no effect of feedback on performance (Locke & Bryan, 1968).

The results of our studies are consistent with this pattern of previous findings. In study 2, computer monitoring coupled with feedback did not produce any significant improvements in performance beyond monitoring without feedback, except under very negative task climate conditions. In study 3, computer monitoring coupled with feedback lowered subjects' performance on the complex anagram solving task. In study 5, subjects who were monitored but did not receive any feedback performed at a higher level than those who were monitored and received either positive or negative feedback. These findings suggest that feedback alone does not guarantee performance improvements.

Unlike feedback, the motivational effects of goal setting are clear and unambiguous. Twenty years of goal setting research has demonstrated goal setting to be an effective motivational technique. Both field and lab studies have shown that people perform at a higher level with an accepted, specific and challenging goal than without one (Locke & Latham, 1990).

In study 2 and study 3, we introduced different levels of goals to monitored subjects. One-third of the monitored subjects received feedback only, one-third received feedback coupled with an easy goal (keep the same pace) and one-third received feedback coupled with a hard goal (increase performance by 30%). The performance outcome associated with goal setting is clear in both studies. Regardless of the goal level, those who received and accepted a goal performed at a significantly higher level than those who did not receive any goal. In both studies, the more difficult goal led to somewhat higher levels of performance than the easy goal, however, the differences were not significant.

5. Conclusion

Computer monitoring has been a controversial issue because of the distinct advantages and disadvantages associated with it. On the positive side, it can provide immediate and objective performance feedback, facilitate goal setting and lead to productivity gains. On the negative side, computer monitoring is often perceived as an invasion of privacy and as an excessive management control tool. It can lead to increased stress and lower job satisfaction among monitored workers.

Findings of the six studies reported here demonstrated that computer monitoring is clearly associated with higher stress levels. Its effects on productivity however, are strongly affected by the complexity of the monitored task; monitoring facilitates simple task performance and impairs complex task performance. Computer monitoring with feedback does not appear to be sufficient for performance gains; goal setting must also be introduced to produce significant performance improvements.

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Table 1. Summary of Six Computer Monitoring Studies

Study	N	Task	Effect on Stress	Effect on Performance
1. Aiello & Svec	72	(c) anagram	Externals experienced more anxiety under CM	CM lowered task performance
2. Aiello & Shao(A)	224	(s) find the vowel	CM led to higher stress level	CM improved perf. in negative climate; CM plus FB and Goal improved performance
3. Aiello & Shao(B)	232	(c) anagram	CM led to higher stress level	CM lowered task performance; CM plus FB and Goal improved performance
4. Aiello, Shao, Chorniak, & Kolb	130	(s) data entry	CM led to higher stress	CM improved task performance
5. Aiello, DeNisi, Kirkhoff, Shao, Lund & Chorniak	213	(s) data entry	Monitored subjects reported more pressure	CM(without FB) led to highest perf.; CM (with FB) led to intermediate perf.; No CM (& No FB) led to lowest performance.
6. Aiello, Kolb, & Wollering	202	(s) data entry	Individually monitored subjects felt most pressure	Perf. was best among those who were individually monitored and part of a cohesive work group

Note: CM = Computer Monitoring; FB = Feedback; (c) = Complex Task; (s) = Simple Task; Perf. = Performance.