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Computer Monitoring in the Workplace: Performance Effects and Perceptions

Kimberly S. Rubenstein
Seton Hall University, kimberly.rubenstein@student.shu.edu

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by

Kimberly S. Rubenstein

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THESIS COMMITTEE
(please sign and date beside your name)

Mentor:
Andrew F. Simon: _____ 7/25/16

Committee Member:
Marianne E. Lloyd: _____ 7/25/16

Committee Member:
Susan Teague: _____ 7/25/2016

Abstract

Computer performance monitoring (CPM) has become prevalent in modern day as several work functions are now completed on the computer. Under the framework of social facilitation effect (Zajonc, 1965), it is possible that CPM may affect performance because of the feeling of being evaluated. In addition to its effects on performance, employees' perceptions of CPM are important to consider when employers are deciding whether or not to implement its use in the workplace. Employees may feel apprehensive about being electronically observed, however CPM can be used to employees' benefit through its ability to provide accurate and detailed information about their performance, which can be used to inform feedback delivery. Providing specific feedback regarding performance has been shown to improve short-term performance, however this has not been studied in the context of CPM. The present study manipulated the specificity of the feedback provided to determine the effects on performance, as well as perceptions of the use of CPM. Though the results of this study did not replicate the social facilitation effect, those who had experienced computer monitored expressed more favorable perceptions of its use than those who had not. This suggests that exposure to CPM may increase acceptance of its use within the organization. Results are discussed in terms of the benefits of CPM for the organizations as well as employees' perceptions of its use.

Dedication

To my ever supportive parents, Mark and Ronni Rubenstein, for always providing me with the opportunities and encouragement to pursue my educational goals.

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Introduction

Over the last few decades, computers have become pervasive; most people have had experience with computers either for personal use, work, research, or otherwise. Technological advances are being utilized for a wide range of uses and have particularly influenced the dynamic of today's workplace. Many office workers complete the majority of their job tasks electronically, which has likely led to the prevalence of computer performance monitoring (CPM). Using a variety of computer hardware, software, and ancillary devices, CPM has emerged as a versatile means by which supervisors record and report work-related activities of their employees (U.S. Congress, Office of Technology Assessment, 1987). CPM is most efficient for monitoring routine job tasks which may be carried out electronically; it records information such as the speed and accuracy with which employees complete their work, error rates, and the amount of time spent on-task or away from workstations (Bates & Holton, 1995). In the late 1980s, an estimated six million clerical office workers were subject to some form of electronic monitoring for evaluative purposes (U.S. Congress, OTA, 1987). By the mid-nineties, that number increased to an estimated 40 million U.S. employees being monitored through electronic mediums (Alge, 2001). It is likely that this number has increased exponentially as computers have become deeply ingrained into everyday work-life.

The use of technology to monitor employees has become a topic of much debate, as the balance between its benefits and disadvantages is still in need of further investigation. Opponents of CPM fear that the information derived from monitoring will be used against them for harsh disciplinary action or possibly termination. These concerns are indeed justified; a 2007 survey of 304 U.S. companies conducted by the American Management Association and ePolicy Institute found that employers commonly reported terminating employees for Internet and e-mail misuse. While remaining on-task at work is certainly of high importance, this rigid workplace

surveillance creates a restrictive and almost threatening work environment, potentially leading to a variety of negative work outcomes such as stress and social isolation (Bates & Holton, 1995). In contrast, CPM provides employers with rich information that can be used positively to the workers' benefit to provide recognition and rewards to high-achievers or offer constructive feedback.

There is evidence to suggest that computer monitoring may also benefit employees because it seems that improved performance can come directly from a person knowing he or she is being observed. Under the principles of a well-studied phenomenon in social psychology – *social facilitation* – the presence of another person has the power to impact performance. While social facilitation has been studied in a variety of settings, the mechanisms by which it occurs has been debated by many researchers (e.g. Baron, 1986; Bond, 1982; Cottrell, 1968; Sanders, Baron, & Moore, 1978; Zajonc, 1965). Computer monitoring can be understood in a manner similar to that of social facilitation in that a supervisor is 'present' virtually through computer technology. However, it may be the evaluative nature of computer monitoring, as opposed to the physical presence of a person, that leads to facilitation effects. The purpose of this paper is to consider how CPM may be conceptualized under this framework, as well as to address individuals' perceptions of its use to ascertain the balance between its potential performance benefits and employee reactions toward CPM in the workplace.

Social Facilitation Research

The development of social facilitation has a long history of competing theories which purport to explain the influence of social presence on individual performance. The literature on social facilitation can be traced back as far as 1898 with Norman Triplett, whose pioneering research emerged after his initial observation that cyclists went faster when competing with other

cyclists as opposed to when they were alone. Triplett (1898) suggested that the sight of a co-actor carrying out the same task encourages the individual to perform that activity at the same or better rate as the other person due to a competitive instinct that increases one's motivation to concentrate energy on that activity. Of course, Triplett's research was conducted by creating competitive circumstances under which participants expect to be compared against one another. Theories following Triplett's (1898) foundational study veered away from examining competition to the more basic elements that may influence individual performance while in the presence of others. Allport (1920) is credited for first coining the term *social facilitation* (Aiello & Douthitt, 2001) and sought to deconstruct this phenomenon to generalize beyond the competitive instinct. Using two mental tasks, Allport found that individuals' performance output was greater while in a group setting than while alone, lending early support for the notion that the presence of others may influence performance.

The social facilitation literature evolved in later years to account for the many forms of social presence and to examine how each of these varying situations may differentially influence performance. Dashiell (1930) suggested that the presence of others results in different social facilitation effects depending on the other person's role because this will alter an individual's perception of the social situation. An early classification of the social facilitation literature diverges into two categories of varying social circumstances: co-action vs. audience effects. *Co-action effects* refer to situations in which another person is present because he or she is engaged in the same activity as the performer, whereas *audience effects* are conditions under which performance is affected by the perception that the other person is an observer (Zajonc, 1965). Audience effects may also differentially affect performance depending on whether the observer is perceived as passive or evaluative (Guerin, 1993).

The early experiments on social facilitation were marked by discrepancies; several studies found facilitating effects of social presence, while others found debilitating effects (for a review, see Bond & Titus, 1983). These inconsistencies were addressed when, following a lull in the literature for several decades, Zajonc (1965) revitalized research in this field by varying the difficulty of the tasks presented to performers. He found that performers benefitted from the presence of another person while completing simple tasks, whereas performance was hindered while doing complex tasks. These findings provided a foundation for the social facilitation literature that emerged in the coming years.

Zajonc (1965) formulated hypotheses on social facilitation based on the Hull-Spence drive theory (Spence, 1956) that helped resolve some of the inconsistencies in the social facilitation literature by examining the performance of an actor under varying degrees of task complexity. The Hull-Spence drive model conceptualizes behavior as a function of both habit strength and generalized drive. Habit strength can be understood as one's level of efficacy or proficiency for a given response or activity, and drive is often conceptualized as a form of arousal. Drive theory builds on this by asserting that the stimulating effect elicited by the presence of others elevates an individual's drive levels, subsequently increasing the emission of a dominant response (Hull, 1943). As Zajonc (1965) noted, it is more likely that an individual will produce correct responses for well-learned or simple tasks, for which good performance is the dominant response. On the other hand, an individual still learning a task or who is engaged in something complex will be more likely to produce incorrect responses. Behavior is therefore governed by increased drive levels, which strengthen the likelihood of emitting the dominant response. This resolved the discrepancy between enhanced or impaired performance in that performance was dependent on the complexity of the task.

Zajonc (1965) concluded that the mere presence of others was necessary to modulate the differences in performance based on task complexity. Moreover, he claimed that not only was presence necessary, but that it alone was sufficient to account for these effects. This assertion was met with much criticism and was reproached by later researchers as an overly simplistic view that discounted intervening factors. Cottrell (1968) offered a different conceptualization of Drive Theory, claiming that drive was not elicited solely by the presence of another; rather, he asserted that drive is learned. One's social context influences how someone behaves because they have learned to associate behavior with a particular outcome, and therefore make inferences based on past experiences about how their own behavior will be perceived (Aiello & Douthitt, 2001; Guerin, 1993). This line of reasoning formed the basis of Cottrell's (1968) theory of *evaluation apprehension*: the expectation of being evaluated increases *learned* drive, accounting for social facilitation effects beyond mere presence.

While Cottrell's (1968) theory of evaluation apprehension is typically housed under the umbrella of Drive Theory, it can also be conceptualized as a means of social comparison. Undoubtedly, successful performance is universally valued, and thus concern regarding a negative appraisal may alter individuals' performance in evaluative situations. According to Cottrell's evaluation apprehension theory, the anticipation of being evaluated stimulates drive based on our learned association between poor performance and subsequent consequences. To demonstrate this, participants in a study conducted by Cottrell, Wack, Sekerak, and Rittle (1968) performed in the presence of two confederates posing as students for a different study. Participants were either told that these confederates were given permission to observe the study while waiting to begin their own, or the confederates were blindfolded, thereby removing their ability to potentially evaluate the actor's performance (also referred to as *evaluative potential*).

Results showed support for Cottrell's rejection of mere presence as a sufficient explanation for social facilitation because no differences in the emission of well-learned responses were found when participants performed alone compared to those who performed in the presence of blindfolded observers. However, performance on well-learned tasks was significantly greater in the presence of an observing audience. This pattern of results led Cottrell to conclude that the evaluative potential of an audience may account for the observed performance effects under conditions of social presence.

As previously noted, Zajonc (1965) argued in his original research that a person's presence is enough to impact performance. Others (Aiello & Douthitt, 2001; Baron, 1986; Bond, 1982; Sanders et al., 1978) claim that this picture is not so simple: factors relevant to the social environment must be taken into account when examining the influence of social presence on performance. In a review of this literature, Aiello & Douthitt (2001) proposed a unified model that integrates the varying elements of the social situation that influence performance, including factors related to the individual, the situation, the task, and social presence (e.g. salience of other's presence, and the role of or relationship with the other person). An in-depth review of this model is beyond the scope of this paper; however, the way in which characteristics of the other person may impact one's performance is addressed below.

During experiments on social facilitation, the primary individual or "actor" is present as well as another person, and the role of the other person may differentially affect how the actor behaves. As originally introduced by Zajonc (1965) and later reinforced by Cottrell et al. (1968), the other person may be perceived as a co-actor or as an observer. Co-actors are individuals who are simultaneously engaged in the same task as the primary actor, whereas observers are present to watch the performance of the actor. Observers may be perceived by the actor as either passive

or evaluative. The expectation of being evaluated may impact the actor's performance by altering his or her perception of the social situation. In a review, Guerin (1993) identified thirty-four studies that addressed the facilitative effects of an observer on performance, four of which failed to find significant results. In these four cases, the null findings could be due to the observer's lack of evaluative potential, either because he or she was in a non-evaluative role (Desportes & Lemaine, 1969), was unable to evaluate performance (Groff, Baron & Moore, 1983), could not physically watch participants' as they performed (Miller, Hurkman, Robinson, & Feinberg, 1979) or was observing a task that could not be easily evaluated (Markus, 1978). This might suggest that removing the evaluative potential of an observer eliminates the effects of social presence on performance.

An early meta-analytic study concluded that the literature on the effects of an evaluative observer are highly variable: studies finding support for the evaluative potential of social presence were counteracted by an equal number of studies which found that it reduced social facilitation effects (Bond & Titus, 1983). However, the results of the meta-analysis may also have been influenced by the way in which "evaluative potential" was operationalized. The authors coded this variable such that evaluative potential was simply presumed if the observer was able to view the actor as he or she underwent the task. It is possible that the explicit expectation, as opposed to the implied assumption, of being evaluated may have a unique impact on task performance. This possibility is addressed in the literature on the social facilitation effects of computer monitoring because employees whose performance is subject to monitoring are aware that its purpose is evaluative.

CPM and Performance

When monitoring technology is implemented in the workplace, there is an understanding between management and employees that monitoring is used for evaluative purposes, such as performance appraisals. The application of computer monitoring extends the principles of social facilitation to suggest that physical presence need not be necessary to elicit these effects, but that instead the expectation of being evaluated changes performance. Though Zajonc (1965) maintained that the presence of another is sufficient to produce these effects, other studies have demonstrated that *indirect* presence of an observer can result in similar outcomes as those found when the observer is physically present. Criddle (1971) found social facilitation effects when participants completed tasks while being watched by observers through a one-way screen. Though the observers were not physically present, the participants were aware that their performance was being observed. The results were consistent with Zajonc's (1965) findings; performance of those being indirectly observed was marked by greater incidences of error on a difficult task than that of those performing alone, suggesting that physical presence is not a requirement. A later study by Park and Catrambone (2007) found that *virtual* presence also has the capacity to elicit social facilitation effects. Using a variety of tasks, they compared performance effects while participants were alone, in the presence of a human, or being observed by a virtual human. The virtual presence of a computerized human was created by presenting the virtual face on a second computer screen situated behind the participant and oriented toward the participant's task screen. Results showed that for all tasks, both the presence of an actual and virtual human resulted in enhancements on easy trials and detriments on difficult trials as compared to the "alone" condition, suggesting that virtual presence is comparable to physical presence in its ability to elicit social facilitation effects.

Studies of computer monitoring emerged to determine whether facilitation effects could be found even when social presence was far less salient, as CPM software allows for observation from remote locations. As such, computer monitoring would only be capable of influencing performance by creating the sense of an *electronic* presence. Though only a handful of studies have been conducted to address the effects of CPM on performance (Aiello & Kolb, 1995; Aiello & Svec, 1993; Davidson & Henderson, 2000; Griffith, 1993; Kolb & Aiello, 1997; Stanton & Julian, 2001; Stanton & Sarkar-Barney, 2003), current evidence suggests that typical social facilitation effects are possible through computer monitoring. For example, Davidson & Henderson (2000) manipulated the perceived presence of computer monitoring by displaying an icon on the screen indicating that the monitoring system was active. As was expected, the presence of monitoring resulted in greater performance on easy trials of a task and worse performance during difficult trials. Consistent with these findings, Aiello & Svec (1993) studied CPM effects using a complex anagram-solving task under a variety of monitoring conditions. Key findings of this research were the expected detriments to performance for conditions in which participants were monitored in-person or via CPM as compared to those performing alone. The combination of results between these and other CPM studies is consistent with classic social facilitation studies. That is, performance on easy or well-learned tasks is enhanced and performance on complex tasks is hindered when an actor's performance is observed electronically.

This CPM research gives preliminary support to the notion that social facilitation effects may extend beyond mere presence of an observer, suggesting that performance may be affected instead by observer's evaluative stance. Computer monitoring affects employees' perceptions in that they perceive its intended purpose is for evaluation, and thus it is possible that the feeling of

being evaluated is the driving factor behind these effects. This proposition is a modern application of Cottrell's (1968) theory of *evaluation apprehension,* and is offered as an alternative explanation to Zajonc's (1965) assertion that the influence is due to the mere presence of another.

Reactions to CPM

The above evidence suggests that computer monitoring may benefit employee performance when it is implemented during completion of easy or well-learned tasks, but its use should be refrained while employees perform difficult or novel tasks. Even with this knowledge, employees' reactions to monitoring are also an important factor to consider when employers make the decision to implement CPM systems in the workplace. Overall, opponents of its use assert that CPM creates a tense and stressful work environment for employees. Worker privacy is an often-noted issue put forth in opposition to the use of CPM, as monitoring could create the ominous feeling that "Big Brother" is watching over your shoulder because one's direct supervisor has the ability to collect information about their work-related and online activities at any given moment. Employees have also reported that the use of CPM commands strict adherence to production standards, shifting the focus toward increased output at the cost of work quality (Bates & Holton, 1995; Grant, Higgins, & Irving, 1988). This heightened emphasis on work output may subsequently result in detriments to employees' social relationships within the workplace because increased work pressure reduces the amount of social interaction both between co-workers as well as with one's direct supervisor, as he or she can acquire information about employee performance without the need to "check in" with subordinates (Carayon, 1993). Furthermore, Carayon (1993) proposed a conceptual model suggesting that these adverse conditions of the job design may indirectly link CPM with chronic work-related stress by

influencing job demands, autonomy, and social support. The tense organizational climate generated by computer monitoring has been reported to produce feelings of social isolation (Aiello, 1993) which may increase levels of worker stress, perhaps mediated by lack of control over one's work (Amick & Smith, 1992; Carayon, 1993) since restrictive work regulations are perceived to dictate employees' work pace and structure.

Despite this, various aspects of monitoring have been shown to positively influence employee perceptions and acceptance of computer monitoring, and when monitoring systems are designed and implemented appropriately, employees will view their use more favorably. Perceived purpose of monitoring is offered as a large contender in determining employee perceptions of computer monitoring (McNall & Roch, 2009). On the one hand, if employees perceive the purpose of monitoring is to deter negative behaviors or to "catch" poor performance, then monitoring will be perceived unfairly because employees will feel that the organization distrusts them (Wells, Moorman, & Werner, 2007). Besides performance management, companies have also reported the use of computer monitoring to track employees' emails and Internet activities in order to curtail improper use. The use of computer monitoring in this way is likely to blame for creating a tense and uncomfortable workplace environment in which employees feel their privacy is breached. On the other hand, when employees believe that monitoring is used for developmental purposes, such as to facilitate employees' professional growth and strengthen their skillsets, then monitoring will be perceived as more fair because this sends a message to the employees that the organizations cares about them and their interests (Wells et al., 2007). Furthermore, the extent to which the information collected from electronic monitoring is relevant to making work-related decisions has been positively correlated with perceptions of procedural justice, defined as the perceived fairness of the procedures used to

arrive at decisions and outcomes, and this relationship was fully mediated by perceptions of invasion of privacy (Alge, 2001). In other words, when the purpose of monitoring is to make work-relevant decisions, such as performance appraisals, employees will perceive the monitoring as more fair because it is considered less of an invasion of privacy. Furthermore, perceived relevance has also been linked to positive employee attitudes such as job satisfaction (Samaranayake & Gamage, 2012). Another characteristic of monitoring that has been suggested to promote favorable perceptions is the frequency of monitoring, perhaps because more frequent monitoring allows for a most representative portrayal of worker productivity (Grant & Higgins, 1991, Moorman & Wells, 2003). In line with this, the degree to which the information gathered from monitoring is perceived as accurate has also been linked to procedural justice, likely because employees' perceptions of monitoring will be more favorable if performance appraisals are based on accurate information about their work performance. Similarly, consistency of monitoring, or the degree to which monitoring techniques are applied consistently across time and across employees, has been significantly correlated with procedural justice (Stanton, 2000). The degree to which employers provide employees with opportunities to voice their opinions and give them control over the design of monitoring systems has also been related to perceptions of procedural justice (Alge, 2001; Stanton, 2000).

Clearly, several factors must be considered when employers begin to design CPM systems in order to ensure that employees perceive its use as fair. Even so, at a basic level CPM has been shown to be viewed more favorably than other forms of monitoring. McNall & Roch (2007) assessed a variety of electronic monitoring mediums in comparison to direct observation from a supervisor to discern perceptions of procedural justice. When asked to imagine they were offered a job at four companies, each of which utilizes a different monitoring technique (direct

observation, computer monitoring, call monitoring, and video surveillance), participants rated computer monitoring as the most procedurally fair. While it could be argued that employees would sooner endorse lack of monitoring entirely than monitoring of any form, it seems unlikely that the use of CPM will cease given the virtualization of the today's modern workplace. Thus, efforts should be directed towards designing CPM systems that both optimize performance and are perceived by employees in a positive light.

One major benefit of computer performance monitoring is the ability of management to use the information gathered about employee performance to provide feedback; however, several aspects of feedback interventions may impact employees' reactions to the feedback they receive. In particular, reactions as a result of feedback source have received much attention, particularly whether the feedback is delivered by the computer or directly by one's supervisor. Earley (1988) found that employees who received computer-generated feedback, as compared to that given by one's supervisor, were more trusting of the feedback and reported greater levels of self-efficacy in relation to their own performance improvement. In addition, Kluger & Adler (1993) assessed whether participants would be more inclined to seek feedback from a computer or a supervisor and found that participants requested computer feedback more often. The results of these two studies might suggest favorable perceptions of computerized feedback, but these studies were not conducted in the context of computer monitoring. Alder & Ambrose (2005) found contradictory results, such that participants perceived computer monitoring as less fair when feedback was computer-generated rather than given by a supervisor. Considering these discrepancies, feedback source may not be sufficient to explain whether feedback is perceived favorably. In the context of computer monitoring, Alder & Ambrose (2005) argued that the constructiveness of the feedback might moderate the effects of feedback source to predict individuals' perceptions of

monitoring fairness. Constructive feedback was defined as that which is specific, informative, non-threatening, and considerate in tone, whereas destructive feedback is general and insensitive (Alder & Ambrose, 2005; Baron, 1993). Person-mediated *constructive* feedback was predicted to increase perceptions of fairness compared to computer-mediated constructive feedback, whereas person-mediated *destructive* feedback was predicted to exacerbate perceptions of monitoring as unfair relative to that received by a computer. Surprisingly, this hypothesis was not supported. While constructive feedback led to higher perceptions of monitoring fairness than destructive feedback, this did not depend on whether the feedback was person-mediated or computer-mediated. Thus, the effects of feedback on perceptions of monitoring fairness remain unclear. On the one hand, it is possible that computer monitoring is perceived as more fair when given direct supervisory feedback because this situation provides an opportunity for social interaction and allows employees to communicate about their performance (Alder & Ambrose, 2005), whereas computer-mediated feedback precludes this ability and employees may feel they are being unjustly evaluated without being given a chance to discuss their performance. On the other hand, computer-generated feedback may be perceived as more accurate and informative, which may explain the higher degree of trust and feedback-seeking of computer feedback exhibited in Earley (1988) and Kluger & Adler (1993), respectively.

In addition to these attitudinal reactions, performance has also been shown to differ depending on whether the source of feedback was from the supervisor or computer-mediated. Not only did Earley (1988) find that individuals were more trusting of feedback when it was delivered by a computer than by their supervisor, but those who received computer-generated feedback displayed significantly greater performance improvements than those who received supervisory feedback. In line with this, Kluger & Adler (1993) found that person-mediated

feedback led to a decline in performance relative to receiving no feedback, whereas computer-mediated feedback resulted in no such decrements. Thus, because person- and computer-mediated feedback are perceived equally as fair when the feedback is constructive, but person-mediated feedback is perceived as more unfair than computer-mediated feedback when it is destructive, computerized feedback seems to be more beneficial because it enhances performance, whereas supervisory feedback leads to performance detriments (Earley, 1988; Kluger & Adler, 1993).

Besides feedback source and constructiveness, there may be other characteristics of feedback which impact employees' reactions to computer monitoring and performance. As mentioned above, Alder & Ambrose (2005) found that perceived fairness of computer monitoring mediated the predictive relationship between feedback constructiveness and performance. In other words, CPM was perceived as more fair when feedback was constructive, and this was also related to increased performance. However, these authors defined the tone and constructiveness of the feedback as one and the same, such that positive and specific feedback was contrasted with negative and general feedback. However, both specific and general feedback may be delivered either with a positive, negative, or neutral tone. Thus, feedback tone and specificity may represent distinct feedback characteristics which may be studied separately. The benefits of feedback specificity on performance have been established (Earley, 1988; Goodman, Wood, & Hendricks, 2004); specific feedback allows individuals to identify the discrepancy between their behavior and the appropriate behaviors necessary for optimal performance because it provides ample information to facilitate corrective action (Goodman et al. 2004). To my knowledge, feedback specificity has yet to be studied in the context of computer monitoring to determine its effects on perceived fairness of CPM.

The Current Study

Early work on the social facilitation effect has demonstrated that the presence of either a co-actor or observer may impact performance. Later work in the field suggests that physical presence need not be necessary to influence performance. There is evidence that classic social facilitation effects can be seen in the context of computer performance monitoring (Aiello & Svec, 1993; Davidson & Henderson, 2000), which assesses performance using remote technology in the absence of another person physically present. Aiello & Douthitt (2001) have suggested that the role of the other person in social facilitation studies may differentially impact performance, such as whether the individual is perceived as evaluative or non-evaluative. In this study, the researcher was presented in a supervisory role in order to create evaluative circumstances, much like the relationship between employees and their direct manager. It is possible that computer monitoring affects performance through its evaluative nature, which precludes the need for the supervisor to be physically present. Many monitoring studies have assessed the performance of several participants simultaneously, leaving open the possibility that the presence of co-actors influences performance of the primary actor. Facilitation by co-actors is distinct from that of an observer, and so participants were assessed individually. In line with classic social facilitation effects, it was expected that:

> *Hypothesis 1*: Computer performance monitoring (CPM), as compared to lack of monitoring, will lead to better performance on easy tasks and worse performance on difficult tasks.

Based on the research of McNall & Roch (2007), this study also assessed perceptions of computer monitoring compared to supervisory observation. Participants in McNall & Roch (2007) read scenarios about companies utilizing various monitoring types, and perceived computer monitoring to be the fairest. In line with their results, it was anticipated that:

Hypothesis 2: CPM will be perceived more favorably than direct observation by a supervisor.

This study also included the delivery of feedback, which is a positive aspect of computer monitoring in that it benefits employees by providing insight into their performance. Feedback specificity is an aspect of feedback interventions that has not received much attention, but it has shown to improve performance over short periods of time (Earley, 1988; Goodman et al., 2004), and so it was expected that:

Hypothesis 3: Specific feedback will lead to better performance than general feedback.

To my knowledge, no previous research has studied employee attitudes regarding the specificity of information provided by feedback. However, because specific feedback provides adequate information about performance to allow for corrective action, I propose:

Hypothesis 4: Those who receive specific feedback will perceive monitoring more favorably than those who receive general feedback.

This study also sought to explore the relationship between monitoring source and feedback specificity, as this has not been addressed in past literature. However, no *a priori* predictions are made about this interaction on either performance or perceptions of fairness.

Method

Participants

One-hundred eighty students (M=19.04 years; 134 female) were recruited from the Seton Hall University human research pool and were given credit towards partial completion of a course requirement. Average years of work experience is 2.66 years, and 18.3% of participant have had prior exposure to computer monitoring. All participants were given an informed consent form outlining details of the study's procedure.

Design

This study utilized a 3 (monitoring: none, direct observation, computer monitoring) by 2 (feedback specificity: specific or general) by 2 (task complexity: easy or difficult) mixed design with monitoring and feedback specificity manipulated between-groups and task complexity manipulated within-groups.

Measures

Performance task. The task chosen for this experiment was Gauss' (1801) modular arithmetic problems used in Park and Catrambone's (2007) study assessing the social facilitation effects of observation by a virtual human. The goal of the modular arithmetic problems is to decide whether a problem statement is true or false. For each problem, the computer screen displayed three numbers in a set format which appear similarly to the following example: 51 = 24 (mod 9). To determine whether the statement is true, participants calculated the difference between the first two numbers (51-24) and then divided the answer (27) by the third number (27/9). If the result is a whole number with no remainder (3) then the statement was to be deemed true. Difficulty of modular arithmetic problems was manipulated by varying the number of digits in the subtraction equation – single-digit no-borrow subtraction operation for easy

problems (e.g. 9 = 4) and double-digit borrow subtraction operation for difficult problems (33 = 19). An equal number of easy and difficult problems were presented. Modular arithmetic problems were chosen for this study because this task utilizes a rule-based algorithm which may be applied to each equation, and controls for prior mathematical experience due to the unusual structure of the equations (Beilock, Kulp, Holt, and Carr, 2004; Park & Catrambone, 2007).

Feedback specificity. On a trial-by-trial basis, participants were provided with performance feedback following each modular arithmetic problem completed, and the feedback was automatically delivered by the computer. Participants either received general or specific feedback. General feedback simply included whether the participant's response was correct or incorrect. Specific feedback also indicated whether the response was correct or incorrect, but also informed participants of the duration it took them to solve the problem and listed the steps to solve so the participant could "check" their work.

Perceptions. A brief questionnaire was generated to gauge participants' perceptions of their experience during the experiment. The questionnaire first informed the participants of the three different observation conditions and then asked them a series of questions regarding their preferences and perceptions of the methods, including an open-ended section in which they were asked to elaborate. The questionnaire can be seen in the Appendix.

Demographics. Information was also collected regarding participants' age, gender, work experience, and prior exposure to computer monitoring in a work setting.

Experimental Conditions

No Monitoring. In line with previous literature, participants in this condition were given no further information besides the task instructions.

Direct Observation. The experimenter remained in the room as participants completed the task in order to observe performance, and was seated behind the participant out of their line of sight while being able to overlook the participants' computer screen. Participants were told that they may not ask questions about how to solve modular arithmetic problems once the task has begun.

Computer Performance Monitoring (CPM). The experimenter explained that they would be observing performance using a computer software that allowed her to remotely observe the participant's computer screen as they completed the tasks. To ensure believability, a screen-sharing service was used, and participants were shown that the task screen was linked to the experimenter's computer.

Procedure

Upon entering the human research laboratory, participants were randomly assigned to one of the monitoring conditions. In all conditions, the experimenter introduced herself as the "supervisor on the current project" to normalize the influence of role on the effect of social facilitation. To maximize generalizability, the research setting was arranged like an office, and participants were told that the study is a work simulation to assess on-the-job performance. The experimenter first explained how their performance would be observed, if applicable, followed by a description of the task instructions. The performance session consisted of one block of easy problems and one block of difficult problems with eighteen trials per block, and order of difficulty was counterbalanced across participants. Following the performance session, those who were being observed were informed that they were no longer going to be observed. For those in the *Direct Observation* condition, the experimenter left the room at this time, and those in the *CPM* condition were shown that the computer software was terminated so that the

experimenter could no longer observe their computer screen. At this time, participants completed the brief questionnaire and answered demographics questions.

Results

Performance

A 3 (observation: none, direct observation, computer monitoring) by 2 (feedback specificity: general, specific) by 2 (task complexity: easy, difficult) by 2 (order: easy/difficult, difficult/easy) mixed factorial ANOVA with accuracy as the dependent variable revealed a main effect of task complexity, $F(1,168)=7.262$, $p<.01$, $d=.24$, with participants responding more accurately to the easy ($M=.915$) than difficult ($M=.886$) modular arithmetic problems. No other main effects were significant, nor were any two-way or three-way interactions, all p's$>.05$. The four-way interaction was significant, $F(1,168)=3.344$, $p<.05$, which was qualified by an two-way interaction between observation method and order. Those who were observed directly by the supervisor and completed the difficult problems first were more accurate on the easy problems (M=.916) than the difficult problems (M=.859).

The data were then analyzed using a 3 (observation: none, direct observation, computer monitoring) by 2 (feedback specificity: general, specific) by 2 (task complexity: easy, difficult) by 2 (order: easy/difficult, difficult/easy) mixed factorial ANOVA with task performance as the dependent measure using average reaction time in milliseconds. The only within-subjects variable was task complexity. A main effect of task complexity was revealed, $F(1,168)=619.03$, $p<.001$, $d=2.08$, with faster reaction times for easy problems ($M=3309.12$) than for difficult problems ($M=11812.6$). Main effects of observation, $F(2,168)=1.2$, $p>.05$, feedback, $F(1,168)=.16$, $p>.05$, and order, $F(1,168)=3.27$, $p>.05$, were nonsignificant. Contrary to previous findings on the social facilitation effect, there was no interaction between task complexity and observation method, $F(2,168)=.787$, $p>.05$. It was expected that those who were observed either physically or electronically would have improved performance on easy tasks and impaired

performance on difficult tasks relative to those who were unobserved. Rather, it was found that participants in all observation conditions performed similarly on the easy and difficult tasks. There was also no interaction between task complexity and feedback, $F(1,168)=.03$, $p>.05$. Unexpectedly, there was an interaction between task complexity and order, $F(1,168)=22.56)$, $p<.001$. Those who completed the easy problems prior to the difficult problems solved the latter more quickly than those who completed the difficult problems first, whereas reaction times for the easy problems remained consistent regardless of order. This might suggest that completing the easy problems first serves as practice for the difficult problems, but completing the difficult problems first does not facilitate performance on easy problems, perhaps due to ceiling effects. No other interactions were significant, all *p*'s>.05.

Perceptions

Fixed-format items. A chi-square test revealed significant differences across the observation groups for observation method preference, $\chi^2(4, N=180)=55.62$, $p<.001$, as seen in Figure 1. The majority of participants who were not observed indicated this as their preference (73%), and very few noted that the supervisor observing presently would be their preference (5%). The preferences of those who were observed physically by the supervisor showed less of a gap, with 57% indicating they'd have preferred to not be observed and 27% preferring the supervisor being present. It's possible that those who were not observed speculated about the experience of being directly supervised and imagined this to be unappealing, whereas those who had experienced it were less averse to it. There was not much of a difference between these two groups in terms of their preference for computer monitoring – 22% of those unobserved and 17% of those directly supervised. A different pattern emerged for those who were observed via computer monitoring, which mirrors the preferences of those who were not observed. The

majority of those who performed under computer monitoring conditions indicated this was their preference (68%) whereas only 27% would have preferred to not be observed. Again, very few in this group indicated that they'd have preferred the supervisor to be physically present (5%).

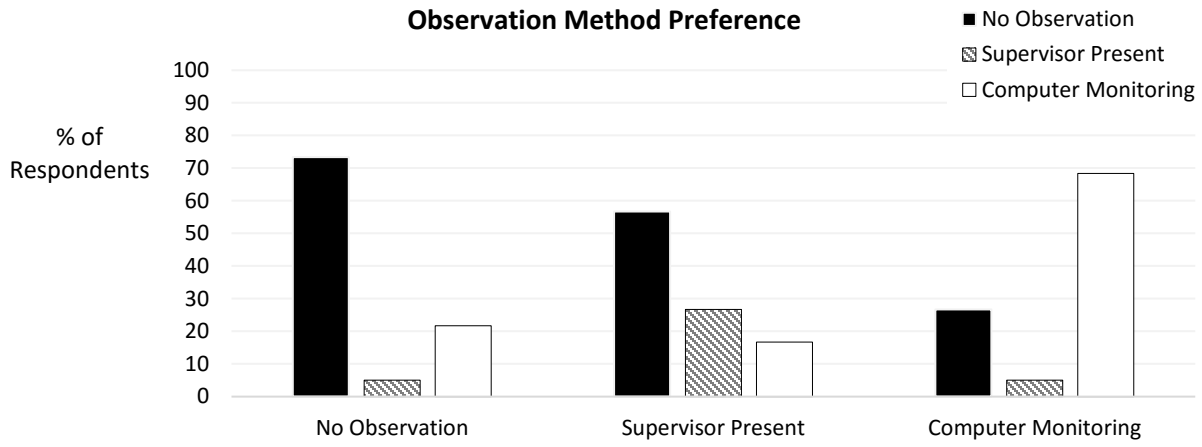

Figure 1. Observation method preference by percentage of respondents per group.

Another chi-square test revealed significant differences in perceptions of fairness across the three observation groups, $\chi^2(4, N=180)=44.18$, $p<.001$, seen in Figure 2. An approximately equal number of unobserved participants indicated that no observation or computer monitoring is the fairest method of observation, 48% and 47% respectively, but only 5% believed that the supervisor observing physically is the fairest. The pattern of responses of directly supervised participants were more distributed. Unlike the other two groups, most participants believed that direct supervision is the fairest option (40%), followed by computer monitoring (33%), and the fewest participants indicated no observation as fairest (27%). Finally, the perceptions of fairness of those who were computer monitored mimicked that of their preferences, with a majority of participants believing this to be the fairest method (73%). Eighteen percent of this group believed no observation to be fairest, and only eight percent indicated that the supervisor observing directly is fairest.

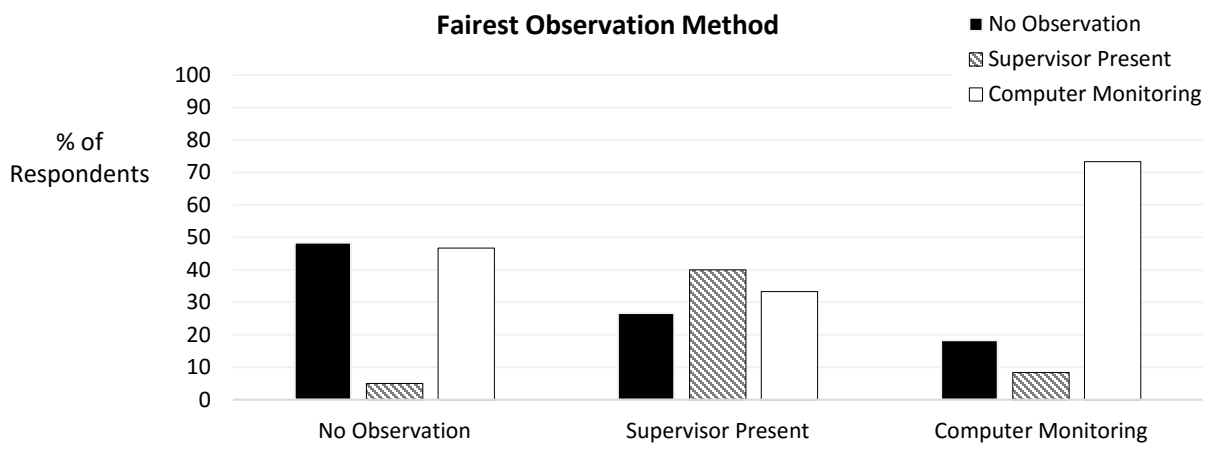

Figure 2. Fairest observation method by percentage of respondents per group.

Although there were no differences in performance across the three groups, chi-square tests were conducted to examine participants' perceptions of whether the way in which they were observed (or not observed) helped their performance, $\chi^2(4, N=180)=24.75$, $p<.001$, and which method they believed would have provided the greatest advantage for completing the task, $\chi^2(4, N=180)=31.68$, $p<.001$. These results can be seen in Figures 3 and 4, respectively. In regards to whether the observation method each participant experienced helped them perform, more people confirmed that the way in which they were (or were not) observed was beneficial to their performance. However, the quantitative differences varied most notably in the group that was unobserved. Seventy-eight percent of those unobserved believed this helped them perform, only three percent believed it did not, and eighteen percent indicated it made no difference; the patterns of responses of the other two observation groups were much less distinguished. When asked to indicate which observation method they believed would have provided the greatest advantage for performance, the majority of those who were unobserved (62%) or observed directly by the supervisor (50%) believed that no observation would have been most advantageous to performance, and fewer participants in both of these groups indicated their

either direct supervision or computer monitoring would be most advantageous. To summarize, the majority of those who were unobserved found this to be most beneficial, and though more participants who were directly supervised found this to be beneficial for performance than did not, the majority of this group believed that no observation would have been most beneficial. Again, the pattern of responses of those who were computer-monitored was quite distinct. Although most participants in this group believed that there would be no difference between the three observation methods in terms of their benefit to performance (37%), nearly one-third (30%) believed that computer monitoring was in fact the most advantageous, and the number of participants indicating that either no observation or direct supervision would be most advantageous did not differ (17%). Thus, in terms of their preferences, perception of fairness, and perceived effect on performance, those who had experienced computer monitoring exhibited more favorable views than those who had not.

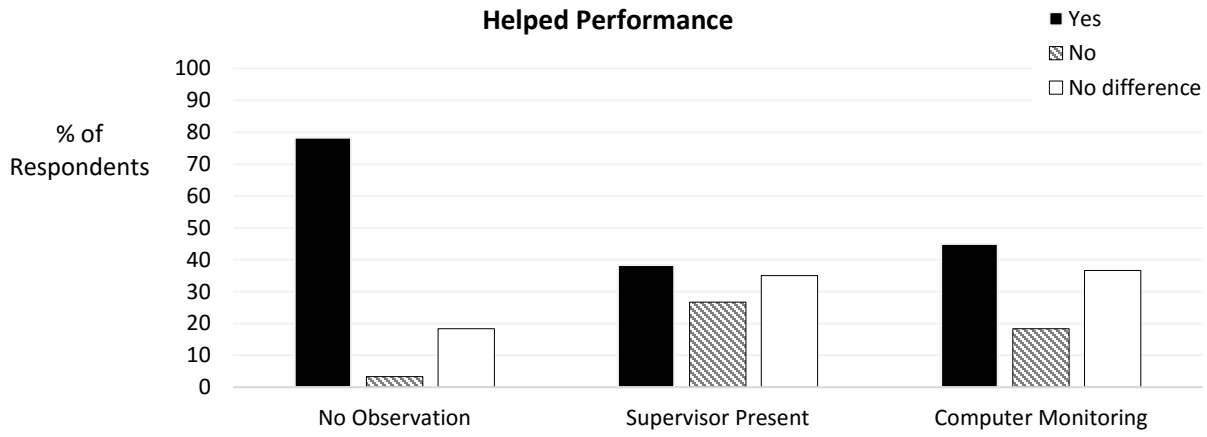

Figure 3. Belief that the observation method experienced helped performance.

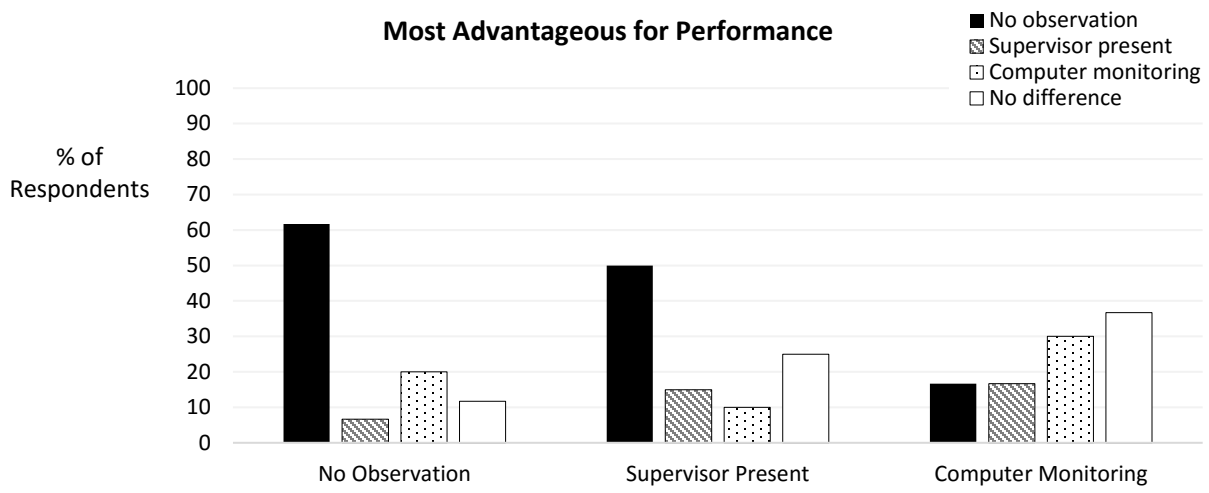

Figure 4. Belief regarding the most advantageous observation method for performance.

Open-ended responses. Participants' responses to the open-ended questions were coded on the bases of the following categories: discomfort, pressure to perform, and positive regard. A response was coded as "discomfort" if the participant mentioned any of a variety of negative affective states, such as nervousness, anxiety, pressure, stress, or tension. Responses were operationalized as "pressure to perform" if the participant indicated the need to be accurate or sense of urgency during the performance session. Lastly, "positive regard" referred to any indication that the participant liked or enjoyed the observation, or if they included other generally positive keywords. The primary author and an additional independent rater individually scored the data into these categories. Inter-rater reliability was high: discomfort, 93.3%; pressure to perform, 93.9%; and positive regard, 92.2%. Disagreements were discussed, and the final decision was given to the author in the rare instances when an agreement could not be reached.

Chi-square tests revealed significant differences between the three observation methods in their expressions of discomfort, $\chi^2(2, N=180)=21.96$, $p<.001$, pressure to perform, $\chi^2(2, N=180)=17.35$, $p<.001$, and positive regard, $\chi^2(2, N=180)=13.19$, $p<.001$. Standardized adjusted residuals were calculated in order to determine group differences. More participants who were

directly supervised expressed discomfort (31.7%) or felt pressured to perform (28.3%), whereas fewer unobserved participants shared these feelings, with only 1.7% indicating as such for each category. The number of computer-monitored individuals did not differ either for discomfort or pressure to perform. Lastly, fewer supervised participants (10%) and more computer-monitored participants (38.3%) expressed positive regard, and the number of unobserved participants did not differ (30%).

Additional analyses. It was also hypothesized that specific feedback would lead to more favorable perceptions of computer monitoring because it provides information about one's performance, which could facilitate later improvement. Chi-squares were conducted on those who were computer-monitored, however there were no significant differences between general and specific feedback in terms of their observation method preferences, $\chi^2(2, N=60)=3.19$, whether they believed computer monitoring helped their performance, $\chi^2(2, N=60)=1.58$, which method they believed would have provided the greatest performance advantage, $\chi^2(2, N=60)=6.76$, or which method they believed was fairest, $\chi^2(2, N=60)=1.11$, all *p*'s >.05. In sum, perceptions of computer monitoring were not affected by the specificity of the feedback.

Discussion

In contrast to previous studies, the current study did not replicate the social facilitation effect for both the direct supervision and computer monitoring conditions. One explanation for the lack of findings is the use of modular arithmetic problems as the measure of performance. To my knowledge, Park and Catrambone (2007) is the only study that utilized modular arithmetic problems to examine social facilitation effects, and though they found these effects when participants were observed either with a human present or while being observed by a virtual human face, this was not replicated in my study even when the supervisor was observing in person. Most studies that have found social facilitation effects with computer monitoring used an anagram-solving task, and so it is possible that social facilitation effects are not extendable to all types of tasks. It was also expected that specific feedback would improve performance more so than general feedback because the former allows individuals to compare their behaviors to those necessary for optimal performance (Goodman et al., 2004). This was not found, however, which could also be explained by the chosen task. Modular arithmetic problems can be solved using a simple formula, and could be largely susceptible to practice effects. Thus, providing feedback may not have had a large enough effect to facilitate performance above and beyond mere practice. As a follow-up to this experiment, a work-related task should be used to increase generalizability of computer monitoring in the workplace and to determine whether the social facilitation effect extends to more realistic job tasks.

Though social facilitation effects were absent for both observation groups, the demographics of the participants in this study may have contributed to the lack of performance effects for those who were computer-monitored. The average age of participants in this study was 19 years with 2.5 years of work experience. It has been proposed that the feeling of being

evaluated drives social facilitation effects (Cottrell, 1968), but people of this age may not have been as affected by being observed electronically because they are likely more accustomed to technology's pervasiveness in daily life. This might suggest that as younger generations begin to enter the workforce, acceptance and embracement of computer monitoring as a method of assessing performance will become more widespread due to prior experience with technology. Furthermore, experience with computer monitoring specifically could also have been a driving factor toward more favorable perceptions of its use, and this possibility is highlighted by these participants' questionnaire responses. Those who had experienced computer monitoring in this study reported more favorable perceptions of its use relative to those who had had not experienced it. This has implications for the workplace in that employees may have preconceived negative opinions regarding computer monitoring prior to exposure, but may become more accepting over time.

The purpose of monitoring in the present study was to allow the 'supervisor' to observe performance and examine its effects. However, computer monitoring in the workplace in often not limited to performance tracking. A good portion of electronic monitoring platforms serve to ensure the appropriateness of employee communications whilst using the company's server (Eivazi, 2011). According to a 2007 survey by the American Management Association and ePolicy Institute, 43% of the companies surveyed practice some form of e-mail monitoring and 66% track Internet usage in order to examine the type of websites and amount of time employees spend on-line. Employers are quite justified in their use of this seemingly scrutinous form of electronic monitoring, as it is both their financial and legal obligation to curtail misuse of the network services they provide to their employees. In terms of financial motivations for computer monitoring, employees' use of the company's servers for personal reasons may result in financial

harm to the company due to loss of productivity (Eivazi, 2011). More importantly, though, is the legal liabilities that are at stake from e-mail and Internet misuse. Simply by providing employees with electronic services such as e-mail and Internet, businesses may be held accountable for their employees' use of these services for mischievous purposes, such as "copyright infringement, defamation, sexual and racial harassment, [and] disclosure of confidential information and trade secrets" (Eivazi, 2011, p.519). For these reasons, the use of electronic monitoring seems justifiable in order to prevent improper use of network services.

Despite this, the justifiability of computer monitoring must be reconciled with employees' perceptions towards its use. As previously mentioned, the use of computer monitoring may create a tense organizational climate due to the feeling of being constantly watched by one's supervisor. Yet the results of the present study suggest favorable perceptions of its use, with several participants even expressing an understanding that the use of computer monitoring is a beneficial way for the supervisor to observe performance without the added pressure of in-person observation. This is much in line with the results of Sarpong & Rees (2014), a study in which employees of the Welsh Ambulatory Services Trust (WAST) were surveyed about their perceptions of the electronic monitoring technology implemented in their workplace. The survey included employees across the organizational spectrum, including managers and staff and individuals from a variety of departments. The majority of survey respondents, regardless of seniority or job function, held either neutral of positive beliefs toward electronic monitoring, and all respondents recognized the importance of its use to ensure compliance with organizational policy, prevent misuse, and manage performance. Considering Sarpong & Rees' (2014) study was conducted very recently, the employees' positive regard for electronic monitoring supports the possibility that its use may be gaining more acceptance in the

workplace in modern day, in which technology is ubiquitous and an expected part of life. In fact, it would seem that computer monitoring is not only more accepted in and of itself, but it is also viewed more positively than traditional forms of employee observation, such as direct supervision. More participants in the present study who were directly observed expressed discomfort toward in-person supervision, and more computer-monitored participants expressed positive regard for this method of observation. Indeed, there seems to be a shift in favor of computer monitoring as an alternative for direct observation from the supervisor. That said, acceptance of electronic monitoring of any type depends largely on proper design and implementation of monitoring systems. In particular, monitoring is more likely to be accepted if it is used to collect work-relevant information only, if it is applied consistently across time and across employees, and if employees are given the opportunity to provide input into the design of the monitoring system (Alge, 2001; Stanton, 2000). Furthermore, when the perceived purpose of electronic monitoring is for employees' benefit, its use will be perceived more favorably (Wells et al., 2007). A survey of customer service and sales representatives found that these employees perceived monitoring as more fair when they believed that its purpose was to develop appropriate behaviors, and perceived it as less fair when it was used to deter inappropriate behaviors (Wells et al., 2007). The delivery of specific feedback about one's performance may be considered a developmental purpose because it allows individuals to improve their behavior to optimize performance. Thus, the present study assessed whether those who received specific feedback about their performance would perceive computer monitoring more favorably than those who received general feedback; however, perceptions of computer monitoring did not differ between these two levels of specificity. This study did not include a group that received no feedback, however, and so it might be the case that the simple inclusion of feedback may be

perceived as developmental so long as its purpose is to enhance performance. This possibility should be addressed in future research.

The aim of this study was to examine the balance between the effects of computer monitoring on performance and perceptions of its use in a workplace context. Though the present study did not find social facilitation effects on performance, participants in this study who had experienced computer monitoring exhibited more favorable perceptions toward it. A future direction of this work would be to conduct this study in a more applicable context, either with a work-related task or in an actual workplace with employees performing their regular job functions. It would be an important contribution to determine the impact of computer monitoring on performance in consideration of employees' reactions to its use in order to enhance our understanding of the best implementation to optimize both productivity and acceptance. Computer monitoring may be an effective tool for supervisors to track and manage employees' work-related behavior, but it would be most effective when it does not impede employees' work by causing undue pressure or discomfort. Thus, the effects of computer monitoring on performance and employee perceptions of its use is certainly in need of further examination.

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Appendix

Perceptions of Observation Methods Questionnaire

1. Which observation method would you have preferred?
   a. None
   b. Supervisor Present
   c. Computer Monitoring

2. Do you feel the way in which your performance was observed (or not observed) helped you complete the task?
   a. Yes
   b. No
   c. No difference

3. Which of the three observation options would have provided the greatest advantage in doing this task?
   a. None
   b. Supervisor Present
   c. Computer Monitoring
   d. No difference

4. Which of the three observation options do you feel is the fairest for observing your performance?
   a. None
   b. Supervisor Present
   c. Computer Monitoring

5. Open-ended:
   a. Overall, how do you feel about the way in which your performance was observed (or not observed) during this study? Please be as specific and detailed as possible.
   b. Please provide any additional comments you have about the way in which your performance was observed (or not observed). Please be as specific and detailed as possible.