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The effects of electronic performance monitoring on performance

Laila June Bidaki

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THE EFFECTS OF ELECTRONIC PERFORMANCE MONITORING ON PERFORMANCE

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Psychology:
Industrial/Organizational

by
Laila June Bidaki
September 2004
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ABSTRACT

The social facilitation effect was analyzed as it pertains to electronic performance monitoring (EPM), using 158 undergraduate students as participants in a lab study. Social facilitation as it applies to EPM is important as many organizations have begun monitoring employee performance by electronic means. Electronic performance monitoring, performance monitoring, social facilitation, drive, mere presence, awareness of observation and self-monitoring are discussed as they pertain to social facilitation in electronic performance monitoring. The study included four experimental groups; two groups solved easy anagrams and the other two solved difficult anagrams. The results were not supportive of the hypotheses in that the social facilitation effect was not present, and there were no performance differences between high and low self-monitors. Discussion focuses on fundamental relationships the potential implications and limitations of this study as well as future research ideas.
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CHAPTER ONE

INTRODUCTION

Over the past few decades research has focused much attention on performance appraisals in organizations. One reason for the voluminous research literature on performance appraisals is that the way in which these appraisals are conducted is rapidly changing. The changes are the result, in part, of advances in technology used in the workplace. It is becoming common for employees to be working from home using technology such as their fax machines, personal computers, the Internet. There has been an overall increase in number of computers in the workforce in general. In a survey conducted in 2001, it was found that approximately 25 million people did do some of their work at home, an increase in comparison to approximately 22.4 million in 1997. It has been estimated that 80% of those doing some amount of work from home are using a computer (Bureau of Labor, 2001). A question that may arise as more employees are beginning to work from home is, how does management monitor and assess their performance?

One method that is starting to be used in organizations, to accommodate work from home, virtual work
Electronic performance monitoring is becoming more popular as it is necessary in some situations (e.g. work from home), and more convenient in others (e.g. virtual work teams), where the manager can review performance at a later time. In fact millions of American workers have been
electronically monitored in some form (Hedge & Borman, 1995). In the past few years, approximately 26 million workers have been electronically monitored at work (Mishra & Crampton, 1998). The American Management Association estimated that in 2001, 78% of mid to large size companies were using some form of electronic monitoring (Moorman & Wells, 2003). Electronic monitoring can range from listening in on or recording phone conversations, to video taping, to the more recent and growing in popularity computer monitoring. In computer monitoring, programs have been designed to record or evaluate information related to the specific performance criteria such as time on computer, keystrokes and accuracy, speed, idle time, or even watching the employees' computer screen through their own (Hedge & Borman, 1995; Mishra & Crampton, 1998). It is also possible for electronic monitoring to allow real-time observation of performance.

Performance appraisals are commonly used by management to better understand an employee's performance. Measures of employee performance are important to the organization as they are used to conduct an evaluation of the employee, which can be critical to organizational functioning. Performance appraisals are used for decisions in promotions, raises, layoffs, placement, and employee
development (Viswesvaran, 2001). Performance monitoring is a common tool used in the performance appraisal process where by an observer such as a manager observes an employee's performance in some manner, such as in-person or listening in on phone recordings, to monitoring a computer screen, in order to assist in the performance appraisal process. As one step in the appraisal process monitoring helps to gain knowledge of the employee's actual job performance.

Performance Monitoring

Performance monitoring is the process by which one actively observes an employee's behaviors in terms of performance in order to assist in the appraisal process. The purpose of monitoring performance is to provide means for management to be able to assess performance levels.

The information collected from performance monitoring can be used in a variety of ways. Two popular uses are to assist in administrative decisions and development of employees. Studies conducted in the 1970's suggested that more than 50 percent of job performance assessments were used for administrative purposes such as, pay, promotions, and layoffs (DeVries, Morrison, Shullman, & Gerlach, 1986; as cited in Viswevaran, 2001). Feedback can be used to
convey to the employee where they may have weaknesses and where their strengths are, which may then be helpful in the process of employee development (Viswesvaran, 2001).

Traditionally, performance monitoring has been conducted in-person, using supervisors, peers, subordinates and customers, who would actually observe performance of the employee in person. The increased use of technology, as in the popularity of personal computers at home and the wide use of computers in many industries, is leading to many significant changes in the ways that performance monitoring is conducted in organizations (Hedge & Borman, 1995). For example it is becoming more popular to have employees working from home, telecommuting and working in virtual organizations (Bureau of Labor, 2001). It would be difficult to continue to rely on old forms of performance monitoring such as using peers to monitor and subsequently rate the employee when they are working in separate locations (Hedge & Borman, 1995; Ilgen & Pulakos, 1999; Murphy & Cleveland, 1995). Consequently, electronic performance monitoring has emerged as a viable approach to observing performance in situations where in-person observation is not practical.

It is difficult to observe the performance of employees who are not in the same physical location as the
rater, for example when employees are working from home. Consequently, the job of rating subordinates is becoming more difficult. Not only are some employees no longer at the same work site, but also with the advances in technology programs and software the supervisors are not always familiar with the job of all the employees under their supervision (Murphy & Cleveland, 1991). This makes it more difficult for on-site supervisors to give accurate performance ratings, because they cannot accurately monitor and therefore assess performance (Ilgen & Pulakos, 1999). Suggesting that computer monitoring may be needed for management to accurately assess performance.

Problems also arise in the accuracy of performance appraisals with peer-ratings, when there may be no little access to observing each other at work as different forms of telecommuting increase. Thus, using traditional means of peer assessment may be less useful or accurate because they can no longer observe each other in person. There are fewer problems in terms of the use of self-ratings, as it becomes more popular for employees to be working in isolation to be the only ones who have familiarity with their actual performance of job activities (Hedge & Borman, 1995). However self-ratings tend to not provide sufficient information when being used for administrative
proposes (Hedge & Borman, 1995; Murphy & Cleveland, 1995). This is because when self-ratings are used people tend to rate themselves inaccurately, usually higher than others such as a supervisor may have rated them (Murphy & Cleveland, 1995). Again clarifying that computer monitoring is needed to continue accurate assessments needed for organization growth and development.

Also a suggested solution is to use ratings that are objective. Objective ratings have fewer errors associated with them in term of rater errors (Murphy & Cleveland, 1995). Computer monitoring is also a helpful tool in objectively assessing performance (Murphy & Cleveland, 1995). Collectively, these concerns about obtaining accurate appraisals of performance underscore the need for electronic performance monitoring, when performance cannot be monitored in person.

To understand the role of EPM in the performance appraisal process, it is first necessary to discuss some general issues within performance monitoring. For example it is known that performance monitoring can have an effect upon employee morale, attitudes, as well as their productivity levels (Hedge & Borman, 1995; Mishra & Crampton, 1998). For example performance monitoring can lead to negative attitudes toward the organization (Murphy
& Cleveland, 1995). Thus it can be seen that there are problems that may arise when organizations use performance monitoring. Although attitudes towards the appraisal process are important, the focus of the current study is on the social facilitation effects of monitoring on performance, which are not a function of individual attitudes about the process itself. As companies begin to have more employees working from various locations it is important to use electronic performance monitoring, however there is very little known about the effects it may have on employees. The purpose of this study is to examine how performance may be affected by electronic monitoring, using social facilitation theory to help understand performance changes commonly seen when there is an observer present.

Social Facilitation

Social facilitation has been the focus of research in recent studies (e.g., Aiello, 2001; Davidson & Henderson, 2000; Huguet, 1999) perhaps for the reason that technology and ways of monitoring performance are changing so often. The changes lead to many unknowns about how this will affect the employees. Social facilitation is the positive or negative impact that the presence of others may have on
an individual's performance. This is important to the study of performance monitoring, because there must be some presence of another in order to monitor performance. Social facilitation theory explains and predicts the change in a person's performance in response to the presence of an observer. The underlying assumption is that the presence of another will cause performance to differ from performance levels when the individual is working in isolation (Aiello, 2001; Davidson & Henderson, 2000).

It is found that for easy, repetitive, or well-learned tasks, performance is increased in the presence of an observer. Conversely, for difficult, unlearned, or cognitively demanding tasks, performance is impaired in the presence of an observer (Davidson & Henderson, 2000; Douthitt & Aiello, 2001; Zajonc, 1965). Zajonc (1965) found that performance was decreased in accuracy but performance in terms of output was increased on unlearned tasks. This suggests that while being observed on unlearned or difficult tasks, performance output is increased (similar to performance increases on learned or easy tasks) but the dominant responses are incorrect (i.e., errors were being made). In both easy or learned tasks and difficult or unlearned tasks there is arousal that increases response rates. This would explain
why we see performance increases on easy tasks and more errors on difficult tasks. This is similar to what Weiss and Miller (1971) state, that drive induced from an audience (i.e. observers) increases all responses, whether they are correct or incorrect.

To summarize, level of performance is increased in the presence of an observer on easy tasks but performance is decreased on difficult tasks. This is important to consider when an organization is using performance monitoring because the observation itself may be altering the normal performance levels of the employee and causing the performance assessments to therefore be less accurate. The interest of this study is to examine these performance changes when using electronic performance monitoring with computers as the means of observation.

Drive

As far back as 1898 with the work of Triplett, researchers have been investigating the changes in performance that occur when an observer is present. Researchers (Baumeister, 1982; Cottrell, 1972; Duval & Wicklund, 1972; Triplett, 1898; as cited in Aiello, 2001) have looked at competitive instincts, evaluation apprehension, self-presentation, and self-awareness as
possible explanations, but one common thread that appears within many of these models, and the focus in the present study is Drive Theory (Aiello, 2001). Drive is an increase in dominant responses that is aroused by the presence of others (Weiss & Miller, 1971). Drive as referred to in this study is not like that of hunger drive (innate) or thirst but is learned drive. Development of this type of drive arousal comes from repeated exposure (in similar situations) to an audience (observation) where the resulting evaluation is negative. Drive is increased in fear of an evaluation that may cause shame or embarrassment (Weiss & Miller, 1971). Weiss and Miller state that the presence of an evaluative observer is particularly drive arousing. This evaluation by an observer is the most influential factor in fear arousal of drive.

As stated in Weiss and Miller (1971), the effects upon arousal (response), should dissipate after the removal of the observer (stimulus). In escape conditioning, drive is not reduced to zero after removal of the stimulus, partially due to fear of renewal of the stimulus. Analogous to this, drive in the case of being observed should not diminish completely to none, as the observed may be anticipating the next episode of
observation, but arousal should return towards normal levels of arousal. For example, an employee who has just been monitored may not immediately return fully to their normal work behaviors or performance levels. This is because they may be awaiting or anticipating the next performance observation episode and their arousal levels may not yet be back to normal, they may still be elevated. It has been shown in Drive theory and through social facilitation literature that performance does change in the presence of an observer. Yet, another question that arises is, must the observer or other present need to be evaluative or competitive? Research conducted to answer this question is done in the area called "mere presence" studies.

Mere Presence

Zajonc (1965) agreed that drive theory stands strong where other theories have failed, by not being all inclusive of different observer situations, where by the presence of the other does not have to be evaluative or competitive. One differing idea he proposed that increases versatility over some of the past ideas is that the presence of the other may only need to be "mere presence." That is the other is simply present, not necessarily
actively evaluating the performer. Taking this into consideration there is no need for any form of feedback from performance monitoring for arousal to increase. He suggests that mere presence is not only necessary but also sufficient to increase drive, as a result of past learning. Zajonc explains that this mere presence of another increases drive levels, which in turn increase the emission of dominant responses. For easy tasks, dominant responses tend to be correct responses, but for difficult or unlearned tasks these responses tend to be incorrect. Thus it has been shown that social facilitation states performance will change in the presence of an observer in that performance will increase or decrease depending on task difficulty. Drive theory then accompanies social facilitation by finding the same results in performance changes but accounts for it by an increase in arousal. Mere presence suggests that with the learned drive increasing arousal, the observer does not need to be evaluative any longer. Thus from previous experience the observed has associated an observer with evaluations.

The concept of mere presence is important to this study because organizations may be electronically monitoring their employees. Electronic monitoring is similar to mere presence in that there is no physical
observer present and the computer itself is non-evaluative.

Another question that arises when using electronic performance monitoring is, does electronic monitoring have the same effects upon performance as the physical presence of an observer? In Drive and Social Facilitation studies, performance increases on easy tasks and decreases on difficult tasks as a result of a physical presence of an observer. This is becoming of more importance as organizations begin to use electronic performance monitoring as a step in the appraisal process, for which no observer is physically present.

Research by Aiello and colleagues suggests that computer monitoring has the same facilitation and or impairing effect upon performance as the physical presence of an observer (e.g., Aiello & Douthitt, 2001; Aiello & Svec, 1993, Douthitt & Aiello, 2001). Davidson and Henderson (2000) found that performance on simple tasks improved with computer monitoring and performance decreased on difficult tasks. Douthitt and Aiello (2001) also found a decrease in performance on difficult tasks. Thus there seems to be a trend that social facilitation may cross over to observation through electronic monitoring. These studies represent an initial
understanding of social facilitation occurring using electronic performance monitoring. Another similar idea to mere presence that is important, is to what extent does the observed need to be aware of the monitoring for the social facilitation effect to take place?

Awareness of Observation

Awareness of the observation is important because with computer monitoring there is no physically obvious presence of another person. Therefore the performer must somehow be made aware of the observation by an indicator, such as icon or message appearing on the bottom of the screen, if the monitoring is to impact employee behaviors. There are currently no laws requiring organizations to announce when they are electronically observing employees, however some have been proposed which argue that organizations should notify employees in writing at least 24 hours in advance with the date and time of the observation to take place and what data will be collected (Mishra & Crampton, 1998). In 2001 it was proposed that a message must be prominently displayed on the screen when the employee goes to access the network and have a banner that is noticeable and clearly disclosing saying that their work and actions may be viewed or recorded
(Anonymous, 2001). Currently, many organizations are simply observing the employees at unidentified times without the employee knowing when exactly it is taking place (Mishra & Crampton, 1998).

An icon on the computer screen at the time of observation to induce awareness has been used in past research. Davidson and Henderson (2000) in their anagram research, and Douthitt and Aiello (2001) in their research using mathematical calculations, used the icon technique in their research on the impact of computer monitoring, to make participants aware of the observation. In their studies they found that the icon on the computer screen, the simple awareness of an icon on the screen during observation, was sufficient to produce social facilitation on easy tasks and decreased performance on difficult tasks.

Thus is has been shown that social facilitation effects can be seen in arousal increases caused by mere presence of an observer even through the use of an icon on the computer screen.

In addition to the arousal increase attributed to the physical processes of monitoring, another factor that may come into play in the possibility of observing the social facilitation effect in computer monitoring, is the
individual characteristic of self-monitoring. The interest of this study is in the performance changes as a result of monitoring, and as these changes are a reaction to the social situation or context, it is important to understand self-monitoring, as it is a moderator to the reaction of people to the social situation/monitoring.

Self-Monitoring

The basic concept of self-monitoring is that people react to social situations in different ways in reference to their behaviors displayed (Snyder, 1987), some people change their everyday/normal behaviors depending on the situation. People who are high self-monitors tend to change their behaviors in response to social demands or what they perceive is expected of them. People who are low on self-monitoring remain more consistent in their everyday behaviors regardless of social context.

The differing levels of self-monitoring are important to consider in this study because the interest here is social facilitation, which is a social phenomenon and self-monitoring is a reaction to social settings. Individuals who differ in self-monitoring levels may differ in the extent to which social facilitation effects may occur. It has been found that those who are high
self-monitors tend to manipulate their behaviors to better fit the social context or what they believe is the desired image (Snyder, 1987). In other words they tend to behave in the way they believe is expected of them based on social context cues. These people may be more likely to respond to being monitored and change their behavior in response to the monitoring therefore displaying behaviors consistent with social facilitation. In comparison, low self-monitors are likely to illustrate more stable behavior patterns regardless of social context (Day, Schleicher, Unckless, & Hiller, 2002), and thus not displaying the behaviors in performance increases and decrements consistent with social facilitation. Low self-monitors tend to not be as concerned with what is expected of them and assess the social climate less often than high self-monitors and therefore are more consistent in their behavior. This pattern of behaviors in individuals has lead to the findings that high self-monitors more often receive higher performance ratings than low self-monitors as found in the meta-analytic review conducted by Day et al., 2002. The findings of their study imply that self-monitoring is significantly related to job performance. Self-monitoring is related to the other theories in this study in that
behaviors consistent with social facilitation and increased arousal explained by Drive theory may not be apparent in their behaviors as the awareness of an observer in any form whether physically present or merely present will have less of an impact on the behaviors of those who are low on self-monitoring.

Thus it may be expected that those who are high on self-monitoring would be more likely to change their behaviors in the presence of observation and show behaviors consistent with social facilitation. In contrast, low self-monitors may not be as susceptible to the social facilitation effect, due to the fact that they are less attentive to the social context than high self-monitors.

Present Study

The focus of the present study is to investigate how and to what extent social facilitation, drive, mere presence, awareness and level of self-monitoring explain the impact of electronic performance monitoring on individual performance. Electronic monitoring is of increasing importance in the changing workplace, where performance cannot always be monitored in person. Social facilitation, the theory that states that when monitored
(observed) performance on easy tasks is facilitated and performance on difficult tasks is impaired; provides a basis for understanding the impact that electronic monitoring has on performance. This study uses drive theory for an underlying understanding of why Social Facilitation occurs. Drive theory states that it is arousal, which is increased in the presence of others, which causes dominant responses to increase, whether such responses are correct or incorrect. Drive theory also suggests that arousal may not immediately reduce down to zero in apprehension of another observation, but will decrease. Mere presence and awareness were also discussed to explain the extent to which an observer must be present. It is proposed that mere presence is sufficient to show the effects of social facilitation through the increase in arousal levels and that only a computer icon is present to represent observation. Self-monitoring was also discussed suggesting that participants who are high on self-monitoring may be more susceptible to increases in arousal and the social facilitation effect due to observation than participants who are low on self-monitoring.

The present study proposes that social facilitation and mere presence will have the same effects upon
performance when using computers to monitor performance as they have had when a person was present. Performance will increase on easy tasks and decrease on difficult tasks when electronic monitoring is occurring. Keep in mind that using a computer icon on the screen can create awareness. Thus using drive theory as the underlying basis for social facilitation effects, it is predicted that we will be able to control and manipulate the effects of computer monitoring on performance. This study suggests that social facilitation (performance increases and decrements) will be observed using computer monitoring, which stands as a form of mere presence and that awareness of the monitoring can be controlled by a message written on the bottom of the computer screen. It is predicted that performance will change from baseline when being monitored and return towards baseline when not monitored. Therefore it is hypothesized:

$H_1$: In the easy condition time to solve anagrams will be shorter when monitored than when unmonitored. In the difficult condition time to solve anagrams will be longer when monitored than when unmonitored (see Figure 1).
H_{1a}: Performance will return toward baseline when the monitoring is turned off in the unmonitored conditions.

H_{1b}: Performance in trail 3 will return toward performance in the first trial for the monitored conditions.

H_{2}: The effect of monitoring on performance will be greater for individuals who are higher in self-monitoring than for individuals who are lower in self-monitoring.

Figure 1. Proposed Findings
CHAPTER TWO

METHOD

Participants

Participants (N = 158) were recruited from California State University, San Bernardino undergraduate psychology classes. As suggested by Cohen's Power Primer (1992) each group had approximately 40 participants in order to achieve .80 power. The E-MUM group had 38, the E-UMU had 41, and the D-MUM had 38 and D-UMU had 41. Participants were required to be 18 years of age and English as their first language; no other restrictions applied. The total number of men was, 24 and women 134. The average age was 26.6, the range was 18 to 54. Most of the participants were seniors (57.6 percent), 22.8% were juniors, 12.7% were sophomores and 6.3% were freshman. Ethnicity of the sample was as follows: 50.6% were Caucasian, 12.7% African American, 5.7% Asian American, 3.2% Pacific Islander, 25.9% Hispanic, and 1.9% Native American. Participants were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992). Participants received research credit for their participation at the discretion of their professors. Participation was voluntary.
Materials

Anagrams were solved on the computer using the E-Prime program where one anagram was presented to the participants on the screen at a time (see Figure 2). There was a time limit of 240 seconds after which the screen would automatically switch to the next anagram. An answer worksheet was provided for the participants to write the correct answers on before they entered it into the computer. This was so the experimenter could check that they had solved the anagram correctly because E-Prime only records the first letter entered. There were two levels of anagrams, easy and difficult. Normative solution times from Tresselt and Mayzner’s (1966) anagram research were used to construct the easy and difficult anagrams for this study as done in Davidson and Henderson (2000). This study had three sets of ten anagrams for both the easy and difficult conditions (see Appendix A). Thirty easy anagrams were chosen based on median solution times. Solution times for the easy anagrams ranged from less than 17 seconds to 3 seconds. Difficult anagrams were selected from the median solutions time of 57 to 223.5 seconds; these are the thirty highest median solution times. Words that are not commonly used/known in everyday speech (e.g., peony) and anagrams that were also a word even when
jumbled or had more than one known solution were excluded regardless of reported solution time. Anagram performance was measured by time taken to correctly solve, less time to solve the anagram indicated better performance. An unsolved anagram was timed out at 240 seconds for difficult anagrams and 240 seconds for easy anagrams. Incorrect responses were also assigned 240 seconds. Incorrect answers were determined by the answers written on the answer sheet and the first letter entered into E-Prime.

A written message appeared on the screen to indicate observation by experimenter. This message read, "Attention: The experimenter is now logged on." The screen background became blue instead of black (see Figure 3).
Attention: The experimenter is now logged on

Figure 3. Screen Capture Monitored Condition

There was no actual observation by the experimenter at any time. The manipulation of the message and screen color was used to represent observation.

The 13-item revised self-monitoring scale developed by Lennox and Wolfe (1984) was used to measure self-monitoring (see Appendix B). This scale is continuous and uses a 6-point Likert type response format. The scale asks participants to rate how true or false the statements about their behavior in different social situations are. The scale was 0- certainly, always false, 1- generally false, 2- somewhat false, but with exceptions, 3- somewhat true, but with exceptions, 4- generally true, 5- certainly always true. Results of the Day et al. (2002) meta-analysis found an average reliability of alpha = .81,
higher than that of the Snyder (1974) scale and the Gangestad and Snyder (1985) scale (.71 and .80 respectively). The alpha level from this study was .79.

Demographics were collected from the participants including age, sex, year in school and ethnicity. Participants were asked if English is their first language and if they are bilingual. It was important to ask if English was their first language as this was a condition of inclusion in the study. Participants who answered no to English as a first language were excluded from the analysis. As a manipulation check participants were asked how noticeable the observation was (on a five point scale, 5 being very noticeable) and do they feel that it had an effect on their performance (also on a five point scale 5 being very much so) (see Appendix C).

Procedure

Upon arrival participants were told, "You are here to participate in a study that is researching the amount of time it takes to solve anagrams on the computer. Thus after you key in the first letter of the correct answer it will record your time and then seven seconds later the screen will change to the next anagram. You will be presented with one anagram on the computer screen at a
time and will have a set time to solve each. To solve please write the answer on the worksheet provided before you key in the correct word. All of your responses will be recorded by the computer for later analysis, however there may be times when the experimenter will log onto your computer to watch in real time how long it takes for you to correctly solve the anagrams. This message will read, 'Attention: The experimenter is now logged on' and the screen will turn blue."

After being briefed about the process participants were shown the experimenter's computer screen with fictitious data on it. They were be told that when the message, "Attention: The experimenter is now logged on." appears and when the screen is blue, that their screen is being watched and timed by the experimenter.

Participants were randomly assigned to one of four groups, using a switching replications design. A switching replications design was used to capture within and between subject differences in performance between monitored and unmonitored trials. This design is important as differences in monitored versus unmonitored in trial one could be of random variance. However using the switching replications design the experimenter can see in trial two and three if the differences were the effect of monitoring
or random variance by switching the monitoring variable. Thus this design will identify the possibility of making an incorrect assumption of an effect-taking place, when in fact an effect seen in one trial may be random. More importantly is the fact that this method of switching replications can help to eliminate practice effects from emerging in the analysis. By switching the variable of monitoring from where performance is expected to increase to where it should decrease and back the overall effect of increase in performance due to practice can be reduced. It also helps to reduce error from order effects by which for each level of difficulty, one group started monitored and the other unmonitored.

Participants in each group completed three separate performance trials (anagram sets). Groups differed based on the level of difficulty of the anagrams they were asked to solve (hard or easy), and based on whether their first trial was monitored or unmonitored. At the completion of each trial a new set of anagrams was presented. While difficulty level remained constant within group across trials, monitoring status changed after each trial. Thus, participants who were monitored during trial one were unmonitored during trial two, and participants who were unmonitored in trial one were monitored in trial two. This
reversing of monitored status occurred again between trials two and three. Therefore, for each level of difficulty, one group began in the monitored condition and followed a monitored, unmonitored, monitored (MUM) pattern, while the second began as unmonitored and followed an unmonitored, monitored, unmonitored (UMU) pattern, across the three trials. After completion of third set of anagrams participants were directed to see the experimenter in the other room where they were asked to fill out the self-monitoring scale and answer a few demographic questions. After completing all study trials and the survey, participants were debriefed, thanked and excused.
(average time to solve anagrams) and the variable of self-monitoring. The only missing data were from the demographics, which were not relevant to the primary analysis. All participants whose first language was not English (n = 22) were excluded from the analysis. Total N = 158 for the analysis. Manipulation check data was also examined. The mean for how noticeable was the monitoring was 4.03 which equates to "somewhat noticeable." The average response for the question asking about the perceived impact of monitoring on performance was 3.04, which equates to "I don’t know," see Table 1.

Table 1. Manipulation Check Means

<table>
<thead>
<tr>
<th>How noticeable was the monitoring?</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.03</td>
<td>1.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you believe it affected your performance?</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.04</td>
<td>1.3</td>
</tr>
</tbody>
</table>

There were four groups, two groups solved easy anagrams and two groups solved difficult anagrams. There were three trials, each including 10 anagrams, completed by each participant. The three trials were ordered either M-U-M or U-M-U. In the easy condition there were the
monitored, unmonitored, monitored group (E-MUM) with \( n = 38 \), and the unmonitored, monitored, unmonitored group (E-UMU) with \( n = 41 \). For the difficult groups there was the difficult monitored, unmonitored, monitored (D-MUM) with \( n = 38 \), and the difficult unmonitored, monitored, unmonitored (D-UMU) with \( n = 41 \). For means see Table 2 and Figures 4 and 5. Men were evenly distributed through the four conditions; E-MUM had 6, E-UMU = 6, D-MUM = 5 and D-UMU = 7. The average score on the self-monitoring scale was 44.7, with a minimum = 26 and maximum = 65. The

Table 2. Means for Trial 1, 2, and 3

<table>
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<th></th>
<th>T1</th>
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<th>T3</th>
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</thead>
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</tbody>
</table>
Figure 4. Easy Condition Average Time to Solve Anagrams in Seconds

distribution was normal. The mean self-monitoring score for each group was as follows, E-MUM = 46.9, E-UMU = 44.5, D-MUM = 44.9, D-UMU = 42.7 (see Table 3).
Figure 5. Difficult Condition Average Time to Solve Anagrams in Seconds

To test for the main effect of anagram difficulty an independent samples t-test was conducted. The finding was significant $t(156) = -10.372$, $p < .01$. The easy anagrams were solved significantly faster ($M = 72.5$ seconds) than the difficult anagrams ($M = 140.2$).
Table 3. Means for Self-Monitoring Variable (in seconds)

<table>
<thead>
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<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
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<td>65</td>
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<tr>
<td>E-MUM</td>
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<td>61</td>
<td>46.9</td>
<td>7.5</td>
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<tr>
<td>E-UMU</td>
<td>34</td>
<td>58</td>
<td>44.5</td>
<td>5.9</td>
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<tr>
<td>D-MUM</td>
<td>29</td>
<td>65</td>
<td>44.9</td>
<td>7.1</td>
</tr>
<tr>
<td>D-UMU</td>
<td>26</td>
<td>61</td>
<td>42.7</td>
<td>7.4</td>
</tr>
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</table>

To test the study hypotheses a multivariate repeated measures ANOVA was conducted for each of the four groups (see Table 4). Three of the four groups had significant findings. Participants in group E-UMU showed a significant finding, \( F(2, 39) = 4.232, p < .05, \) Wilks Lambda = .822. This suggests that there are significant differences in average solve times between at least two of the trials. The comparison for the D-MUM group was found to be significant, \( F(2, 36) = 7.226, p < .05, \) Wilks Lambda = .714, as well as the D-UMU group, \( F(2, 39) = 3.646, p < .05, \) Wilks Lambda = .842. Also suggesting that there are significant differences in average solve times between at least two of the trials for both the D-MUM and D-UMU groups. The finding for the participants in the E-MUM group was not significant \( F(2, 36) = .922, p = .23. \) These findings were followed by paired samples t-tests to determine where the significant
Table 4. Multivariate Repeated Measures Analysis of Variance

<table>
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<th>Hypth df</th>
<th>error df</th>
<th>alpha</th>
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<td>2</td>
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<td>7.226</td>
<td>2</td>
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<td>0.842</td>
<td>3.646</td>
<td>2</td>
<td>39</td>
<td>0.035</td>
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</table>

differences were between the three trials and the direction of the differences (see Table 5). The first t-tests were conducted within participants in the E-UMU group. There was one significant result, between trial one and trial two $t(40) = -2.1$, $p < .05$. Participants scored significantly lower in trial one ($M = 62.5$) when unmonitored than they did in trial two ($M = 72.8$) when monitored. This means that in the E-UMU group participants did better when unmonitored than when monitored in the first two trials (a lower number equates to a better score). This is an opposite trend than proposed in hypothesis one. Trial two and three showed no significant differences ($M = 72.8$ and $M = 78.4$, respectively).
Table 5. Significant Paired t-Tests

<table>
<thead>
<tr>
<th>Trial</th>
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<th>SD</th>
<th>SE</th>
<th>95% confidence interval</th>
<th>t</th>
<th>df</th>
<th>sig</th>
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</tr>
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<td>DM</td>
<td>T1-t2</td>
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<td>14.2</td>
<td>3.6</td>
<td>14.2</td>
</tr>
<tr>
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<td>T2-t3</td>
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<td>41.4</td>
<td>6.5</td>
<td>-30</td>
<td>3.9</td>
<td>-3.9</td>
</tr>
</tbody>
</table>

A second set of paired t-tests was performed within D-MUM. Again there was a significant difference between trial one and trial two, \( t(37) = 3.6, p < .05 \). Participants scored significantly worse in trial one (\( M = 168.0 \)) when monitored than in trial two (\( M = 135.2 \)) when unmonitored. This is consistent with the hypothesis one. There was no significant difference in scores between trial two (\( M = 135.2 \)) and trial three (\( M = 139.1 \)).

The final t-tests were conducted for the difficult unmonitored, monitored, unmonitored condition. There was one significant finding between trial two and trial three, \( t(40) = -2.62, p < .05 \). This suggests that participants scored significantly lower (better) in trial two when monitored (\( M = 123.1 \)) than trial three when unmonitored (\( M = 140 \)). This is not consistent with hypothesis one. The difference between trial one (\( M = 137.4 \)) and trial two (\( M = 123.1 \)) was not significant.
For hypothesis one (a) and (b) the return towards baseline or return towards performance in trial one, t-tests were not performed comparing trial one to trial three. No t-tests were performed because no group had significant differences between all three trials, thus a test of a return to baseline or performance in trial one would not be warranted. To test the second hypothesis, that participants who score higher on self-monitoring would be more affected by the monitoring than participants who are low on self-monitoring, a repeated measures mixed factorial MANOVA was conducted. There was a significant three way interaction between performance, self-monitoring, and difficulty level, $F(2, 93) = 4.75$, $p = .01$ for the groups that were in the UMU condition. This means that performance level depended upon self-monitoring score (high or low), difficulty level of the anagrams, and the presence of absence of monitoring. However, further t-tests comparing low and high self-monitors in the monitored trial indicate that the differences between the high and low self-monitors are non-significant when monitored. A second factorial MANOVA was conducted for the groups that were monitored first (MUM) and the interaction was non-significant, $F(2, 78) = .63$, $p > .05$. 
CHAPTER FOUR
CONCLUSIONS AND RECOMMENDATIONS

The proposed relationships were not supported in this study. Of the seventeen tests conducted, nine were significant but only seven were in the hypothesized direction. Overall, there was a lack of support for the hypotheses. Although differences in scores across the three trials were evident for three of the four groups, none of the differences were consistent with expectations. The primary research question, that participants solving easy anagrams would do better when monitored compared to when they were not monitored and that participants solving difficult anagrams would do better when unmonitored than when unmonitored was not supported. Participants did not score better on the easy anagrams when monitored as compared to unmonitored. On difficult anagrams participants did not do worse when monitored as compared to unmonitored.

These findings are in contrast to previous research conducted by Davidson and Henderson (2000), Douthitt and Aiello (2001) and Zanjonc (1965) who found increased performance on easy tasks when monitored and decreased performance when unmonitored. However, the above
researchers used different methods of measuring performance and different methodology, which may attribute to the differences in the findings of this study. For example, Davidson and Henderson’s 2000 design used four groups who solved 10 anagrams within the same conditions of easy or difficult and monitored or unmonitored. In contrast to this study (which used time to solve anagrams), they used number of anagrams correct as the dependent variable.

Douthitt and Aiello (2001) used a different task altogether. They presented a set of rules to participants who then needed to apply the rules to solve problems, which required arithmetic calculations. It may be that the task they used was better suited to be categorized as easy and difficult, versus this study, which categorized easy and difficult solely by median solution time. However this method of categorizing tasks as easy versus difficult by time taken to solve is consistent with past research (Davidson & Henderson, 2000). This is because in using arithmetic calculations, the difficult calculations would remain difficult in reference to the process of solving and be less likely to facilitate a practice effect. The process of solving the calculations in itself may have
been difficult, not simply taking longer than the easy calculations.

There was only one comparison in this study, within the D-UMU group, where the hypothesized trend was significant and consistent with the above research, in that the monitored participants did significantly worse than the unmonitored participants. In reference to Hypothesis 1a, it was found that there was no need to test a return to baseline as performance levels did not significantly change across the three trials.

The significant result in trial one for the difficult condition was that participants who were monitored scored significantly worse than the participants who were not monitored. This may have been the result of the first trial being most difficult because participants were learning the process (i.e., writing the answer on the worksheet, then entering the word where the letters do not appear on the screen, and waiting for a seven second delay) and work with the computer, which was complex. Consequently, the social facilitation effect may have emerged because as the theory predicts, there will be performance deficits when the task is difficult or a learning task. It can be seen that the first trial in the difficult condition may have been the most difficult in
that both groups scored worse on the first trial regardless of monitoring (though the D-UMU difference was not significant). However, after this first trial there are no significant differences (and the trends were in the opposite direction of the hypotheses), which may be due to the fact that the process of answering the anagrams was no longer a difficult or new process/task. This would support Zajonc (1965) who states that a new task or a learning task is considered to be difficult, as the process is not well-learned.

It is true that the difficult anagrams did in fact take longer than the easy anagrams, but it may be that they should not be considered difficult, unlearned or new tasks after the first trial (i.e., once participants had familiarized themselves with the task), which might explain the absence of social facilitation effects. As Zajonc suggests, once the task is well-learned or repetitive it is no longer considered difficult in the same way as it was operationalized in this study and previous research (Davidson & Henderson, 2000).

Hypothesis (2), which states that individuals who score higher on self-monitoring would be more affected by the electronic monitoring, was not supported. There was however, a significant interaction of monitoring, anagram
difficulty, level of self-monitoring, on performance. However the trends were in the opposite direction of what was expected and were non-significant. This is in contrast to the Snyder (1987) literature review. Snyder’s research led to the hypothesis that participants who are high in self-monitoring would be more influenced by the context of monitoring than the low self-monitors. In this study there were no significant differences in participants’ performance in the monitored trial between the low and high self-monitors.

One implication of this study is that computer monitoring of performance may not be as salient as the physical presence of an observer and therefore does not affect performance significantly in any direction. This is contrary to the findings of Davidson and Henderson (2000) and Douthitt and Aiello (2001) in their research of electronic performance monitoring using a computer. The effects of electronic performance monitoring may not have the same effect upon performance as the physical presence of an observer in that the physical observer may be more salient, and thus across different methodologies in EPM, there is less consistency in the trends and findings. As the results of this study may suggest, organizations may not need to be as concerned with the effects of computer
monitoring across time (trials) as they need be with physical presence and observation by a person.

Limitations

Overall the lack of significant results may be due to the fact that this sample of participants may not have cared whether they were monitored, as their performance would have had no effect upon them in anyway. This may be evident in that some participants asked why they should care if they were being monitored, during the instructions at the beginning. However it is expected that this reaction would be different in an organization where employees may care about their performance being observed. Thus, it can be suggested that this study may have lacked the experimental impact needed to find a social facilitation effect.

Another related limitation might be that participants may not have felt that their performance was really being watched. That is the monitoring message on the computer may not have induced feelings of being monitored on solving anagrams as most of the work was done on the worksheet not on the computer. Specifically, the experimenter had no way of actually observing the number of attempts the participant had on the worksheet before
the correct answer was found. Thus it is possible that the participants did not feel their actual performance, attempts or process was actually being observed/monitored. As can be seen in the fact that the average rating of whether the participants thought the monitoring had an affect upon them was moderate the rating of, "I don't know," suggesting participants did not think that the monitoring effected their performance in any direction.

Another limitation may have been the tasks were operationalized as difficult by time it took to solve the anagrams, when in fact the process and distinction of well-learned, new task compared to un-learned or repetitive task should have been used to separate the so called easy tasks from difficult ones. The scores for the easy condition appear to be in the opposite direction of the hypothesis in that participants who were monitored took longer to correctly solve the easy anagrams. It is possible that solving anagrams is a new task to the participants and not a well-learned task as suggested is necessary for the increase in performance (Davidson & Henderson, 2000; Douthitt & Aiello, 2001).

The overall null findings may be a result of the effect not being salient over the three trials (averaging across 10 performance episodes), as performance was
measured by average solution times. Thus maybe it would have been better to measure performance more precisely instead of averaged across the 10 anagrams in each set. When scores are averaged across the ten anagrams, trends within one trial may not be apparent.

It appears that in the D-MUM condition there was a practice effect, as the average solution times from time one to time two dropped and then leveled off to time three. Participants may have been learning the task during the first trial. It may have been more difficult for the participants in the difficult condition to become familiar with the task, as they had to figure out the process as well as the very difficult anagrams. Thus, the practice effect may be more apparent in the difficult condition than in the easy condition.

There is anecdotal evidence to suggest that participants may not have exerted as much effort in their performance when the experimenter was not logged on, especially in the difficult condition. It seems that participants attempted to answer fewer anagrams when not monitored. That is, solving the anagrams was so difficult participants may have chosen to not attempt to solve the anagrams when they were not being watched, because they perceived the anagrams to be almost hopelessly difficult.
Some participants expressed that the words were impossible and inquired if they were real words. The difficult anagrams may have been so difficult that participants chose to exert more effort when being observed (to not be caught not participating) than when not observed once beyond trial one.

The average rating of the manipulation check (How noticeable was the observation?) indicated that participants were fully aware of the monitoring. Additionally when participants were asked if they felt the monitoring affected their performance the average response was “I don’t know.” This suggests that the monitoring was not perceived to be important to the participants. However the social facilitation effect has not been framed in terms of needing to be a conscious phenomenon and participants need not be aware of the performance changes (Zajonc, 1965). Regardless, the results do not suggest a social facilitation effect. Therefore it may be not necessary for participants to consciously be aware of the monitoring affecting their performance.

Future Research

One area of future research that emerges from a limitation present in this study is a more careful
consideration of participants' familiarity with the task, in order to remove practice effects. For example an employee who is familiar with their job and their tasks, even if the tasks are difficult they will become easy and well-learned to the employee overtime. In this study the process was quite complex, including a worksheet, color changing screen and typing in responses where the letters did not appear on the computer screen and a seven second delay/limit after the first letter was entered. Future research may find it useful to use other samples of participants such as employees in a work context. This is suggested above as the tasks will then be well-learned and they may care about the results of their work and evaluations by an observer. Thus it was suggested that the task used be well-learned or use a sample of experienced employees, to test the affects of Social Facilitation on a task that is not a learning task.

A learning task may have been inherent in the findings of this study, especially in the first trial for the difficult groups. The pattern found in trial one for the difficult was consistent with that of a learning task, which is considered to be a new, unlearned task, in that the Social facilitation effect was apparent. Thus it was suggested that future research use an employee sample.
This study implies that there is reason to continue this research question as some trends were apparent in this study but not significant and some trends were in the opposite direction. That is, the effect has not been proven by this study to be consistent in different studies with differing methodologies, in that for this study the effect was not found in most cases and only a few significant results were in the predicted direction. It is important to test the effect across varying methodologies and tasks to test the theory of Social Facilitation in computer monitoring. Such as, using different tasks, different monitoring icons or messages, and differing populations.

It may also be important to look at the research findings of other methods of electronic performance monitoring, such as phone recordings and videotaping. These methods of electronic performance monitoring are important to research as well, as they are also good methods for measuring performance when a physical on-site observer cannot be present. It is important because the manipulation of monitoring is different in these methods. For example, with phone recordings there is an actual voice message recording expressing the monitoring and with video taping there is a video camera present, both of
which may be more salient or have differing effects upon performance than a message on the screen and a background color change on the computer. However past research in this area has also been inconsistent and not fully supportive of Social Facilitation Theory (Terry & Kearnes, 1993).

If future research is to be conducted in the academic setting it may be interesting to test the affects of EPM versus the physical presence of an observer. If this method is used it would be possible to more clearly capture the effect. Using both the physical observer and computer monitoring it could represent the effect of the monitoring, with less variability of the task and procedure, as they could be held constant.

Another idea for future research is to have the participants complete a practice session in length to make them familiar with the task and process of completing it properly, to remove the learning variability. If the current study had used a practice session there may have been less practice effect and may have removed the variability derived from learning the task, and made the easy and difficult distinction more clear.

This suggestion for future research is derived from the present study’s limitation that a fatigue effect may
have emerged in the easy condition. As can be seen in the overall increases in average solve times across the three trials. There may have been a fatigue effect in the easy and not the difficult conditions because participants may have been working harder in the easy conditions across all three trials. Participants in the difficult conditions did not seem to exert effort as much when they were not monitored as can be seen by looking at the worksheets, fewer answers were attempted when there was no monitoring. This may be due to the fact that the difficult anagrams were so hard to solve they seemed to participants hopeless and thus they only exerted effort while being watched, to avoid being caught not participating in the study. However, the easy anagrams took effort but did not seem insolvable and were in fact solved correctly a majority of the time.

General Discussion

The results of this study are not supportive of the hypotheses. More than half of the hypotheses tests were not significant and a couple of the ones that were significant were in the opposite direction than was predicted. Thus the findings of this study were not consistent with previous research. The Social Facilitation
effect was not present in the findings of this study using electronic performance monitoring (computer-monitoring) on an anagram task. It is important for future research to continue to study the effect of Social Facilitation in various computer-monitored tasks to test the generalizability of EPM and Social Facilitation. It is also suggested that there may be much to be learned from attempting a similar study with a sample of working employees, where the task is familiar or well-learned and monitoring by management may be more salient than by an experimenter in a lab.

This study concludes that the distinction between easy and difficult anagrams needed to be operationalized as unlearned or new task versus repetitive well-learned task, not just time taken to solve. Overall the findings of this study were not supportive of previous research with electronic performance monitoring and Social Facilitation and the hypotheses of this study. It is suggested that researchers continue to study this phenomenon using different tasks and sample populations. It is important that this research is continued because many organizations are using electronic performance monitoring and millions of workers each year are monitored electronically. Thus it is important that researchers
continue to attempt to better understand the effects the monitoring upon employee performance.
APPENDIX A

ANAGRAMS
The following are the anagrams to be used and their respective median solution times.

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<tr>
<th>Difficult</th>
<th>Second 10</th>
<th>Third 10</th>
</tr>
</thead>
<tbody>
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<td><strong>Second 10</strong></td>
<td><strong>Third 10</strong></td>
</tr>
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<td>Oasis</td>
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<td>Fruit</td>
<td>lufrt</td>
<td>15</td>
</tr>
<tr>
<td>Fling</td>
<td>ifnlg</td>
<td>3.5</td>
</tr>
<tr>
<td>Gloat</td>
<td>oatlg</td>
<td>16.5</td>
</tr>
<tr>
<td>House</td>
<td>euoibs</td>
<td>6</td>
</tr>
<tr>
<td>Roach</td>
<td>hroac</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td><strong>8.75</strong></td>
<td><strong>8.85</strong></td>
</tr>
</tbody>
</table>

low=3
high=16.5
APPENDIX B

QUESTIONNAIRE
Directions: The following statements concern your perception about yourself in a variety of situations. Your task is to indicate the strength of your agreement with each statement, utilizing a scale in which 5 denotes certainly always true, 0 denotes certainly, always false, and 1, 2, 3, and 4 represent intermediate judgments. Please circle the number that best represents how you feel, circle a number from 0 to 5 from the following scale:

5- Certainly, always true
4- Generally true
3- Somewhat true, but with exception
2- Somewhat false, but with exception
1- Generally false
0- Certainly always false

There are no "right" or "wrong" answers, so select the number that most closely reflects you on each statement. Take your time and consider each statement carefully.

1. In social situations, I have the ability to alter my behavior if I feel that something else is called for.
   5 4 3 2 1 0

2. I have the ability to control the way I come across to people, depending on the impression I wish to give them.
   5 4 3 2 1 0

3. When I feel that the image I am portraying isn't working, I can readily change it to something that does.
   5 4 3 2 1 0

4. I have trouble changing my behavior to suit different people and different situations.
   5 4 3 2 1 0

5. I have found that I can adjust my behavior to meet the requirements of any situation I find myself in.
   5 4 3 2 1 0
6. Even when it might be to my advantage, I have difficulty putting up a good front.

7. Once I know what the situation calls for, it’s easy for me to regulate my actions accordingly.

8. I am often able to read people’s true emotions correctly through their eyes.

9. In conversations, I am sensitive to even the slightest change in the facial expression of the person I’m conversing with.

10. My power of intuition are quite good when it comes to understanding other’s emotions and motives.

11. I can usually tell when others consider a joke to be in bad taste, even though they may laugh convincingly.

12. I can usually tell when I’ve said something inappropriate by reading it in the listener’s eyes.

13. If someone is lying to me, I usually know it at once from that person’s manner of expression.
APPENDIX C

DEMOGRAPHICS
On a scale of one to five how noticeable would you rate the message that you were being monitored was?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Noticeable</td>
<td>Somewhat Not Noticeable</td>
<td>I don't know</td>
<td>Somewhat Noticeable</td>
<td>Very Noticeable</td>
<td></td>
</tr>
</tbody>
</table>

On a scale of one to five rate to what degree you believe the observation message may have affected your performance

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not At All</td>
<td>Not Really</td>
<td>I don't know</td>
<td>A Little</td>
<td>Very Much So</td>
<td></td>
</tr>
</tbody>
</table>

Demographics

Male: ______ Female: ______ Age: ______ years

Is English your first language? Yes _____ No _____
Are you Bilingual? Yes _____ No _____

Year in school:
Freshman _____ Sophomore _____
Junior _____ Senior _____
Other ______________________

Ethnicity: (check all that apply)
_____ Caucasian _____ African American
_____ Asian American _____ Pacific Islander
_____ Hispanic _____ Native American
APPENDIX D

WORKSHEET
Worksheet

ID Number ______________

Please feel free to use this and the attached blank sheets as scratch paper, but remember to write the correct answer on the line provided. You will have a time limit to work on each anagram, it is not to rush you so don’t worry, it is to make sure you don’t spend too much time on one anagram; the computer will automatically move you to the next if no response has been entered after the time limit has expired. You may enter the correct response as soon as you can and the computer will move you to the next anagram immediately, be careful to only enter in one response or it will move you past the next anagram and there is no way to return to the previous screen. Please do not go back on the worksheet and fill in or change any answers you didn’t have a chance to solve and please do not guess when entering your answers. Simply try your best.

a) ____________ p) ____________
b) ____________ q) ____________
c) ____________ r) ____________
d) ____________ s) ____________
e) ____________ t) ____________
f) ____________ u) ____________
g) ____________ v) ____________
h) ____________ w) ____________
i) ____________ x) ____________
j) ____________ y) ____________
k) ____________ z) ____________
l) ____________ aa) ____________
m) ____________ bb) ____________
n) ____________ cc) ____________
o) ____________ dd) ____________
REFERENCES


Bureau of Labor.


