4-2004

Exploring the Behavioral Function of Work Monitoring

Don H. Rohn
Western Michigan University

EXPLORING THE BEHAVIORAL FUNCTION OF WORK MONITORING

by

Don H. Rohn

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
April 2004

EXPLORING THE BEHAVIORAL FUNCTION OF WORK MONITORING

Don H. Rohn

Western Michigan University, 2004

A number of studies have suggested the key difference between effective and ineffective managers is the extent to which managers engage in a particular form of monitoring – work sampling (Komaki & Minnich, 2002). Effective managers observe employees instead of relying on self-reports or secondary sources of performance. A factor contributing to the effectiveness of work sampling may be an increase in desired behavior as a function of reactivity to the presence of an observer. In spite of the large volume of research on the effects of observer presence on various physiological responses and task performances (Guerin, 1993), a study has not yet been conducted to discover the functional properties of observer presence – why people change their behavior when an observer is present.

The evocative/eliciting effects of the presence of an observer on behavior are consistent with a number of behavioral stimulus functions and could serve any number of stimulus functions depending upon the behavioral history of an individual. Although evocative effects of observer presence are consistent with multiple discriminative and motivative stimulus functions (e.g., $S^{D\text{-}r+}$, $S^{D\text{-}p+}$, CEO-R), physiological responses elicited by observer presence (e.g., palmar sweat) suggest the nature of the function to be generally aversive. If observer presence is unpleasant, people are likely to work to

terminate or avoid observation (Olson, Laraway, & Austin, 2001) – an undesirable prospect for those whose performance improvement efforts rely on direct observation of employees.

The current study investigated the behavioral function of observer presence by systematically manipulating (a) the presence/absence of an observer, and (b) the operation of a performance-contingent observation termination contingency. A within-subject, multi-element-design, with a non-concurrent multiple-baseline across participants was employed to assess the effects of experimental manipulations. Participant performance met the criteria for termination in 93% of termination sessions. When allowed to choose between observer-present and observer-absent conditions, participants chose to work alone during 92% of sessions. Although these findings suggest an aversive function of observer presence, the specific stimulus function of observer presence still remains in question. An argument for an $S^{D\text{-}p+}$ function of observer presence is made, however CEO-R, and S^{p+} functions are also plausible.

ACKNOWLEDGEMENTS

There are many people who I would like to thank for their support and guidance during the preparation and completion of this dissertation. First, I would like to thank my advisor, Dr. John Austin, for his friendship, encouragement, and direction during the course of this dissertation and throughout my graduate training. I thank Dr. James Carr, Dr. Richard Malott, and Dr. Kevin Munson for their time and support as committee members.

I am grateful to the Graduate College of Western Michigan University and the Western Michigan University Department of Psychology for their generous funding. I could not have completed this research without their financial support

I would like to express my gratitude to family, friends, and colleagues who offered their assistance and support: My mom, Hoo Cha Rohn, for her persistent encouragement, support, and sacrifice; Natalie Rohn for her love and reassurance; Donald M. and Mary Rohn for providing standards of excellence to which I could aspire; Dr. Ryan Olson and Siggurd Oli Sigurdsson for their friendship and advice; and Angie Lebbon, Thomas Burke, Brian Crowley-Koch, Kristen Struss, Stacey Hackett, Dana Harshbarger, and Tiffany Williams, for their exemplary performance as research assistants.

Don H. Rohn

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ii

LIST OF TABLES viii

LIST OF FIGURES ix

INTRODUCTION 1

Social Facilitation 6

Work Sampling and Reactivity 10

Physiological Indicators of the Function of Observer Presence 14

Work Sampling and Behavior Based Safety 15

What is the Function of a Behavior-Based Safety Observation? 16

The Role of Functional Assessment 18

Possible Behavioral Functions of Observer Presence 19

Observation as a Discriminative Stimulus (S^D) for Reinforcement 20

Observation as a Discriminative Stimulus (S^D) for Punishment 21

Observation as a Motivative Variable 21

What is the Behavioral Function of Observer Presence? 22

METHOD 24

Participants 24

Participant Recruitment 24

Consent Process 24

Duration 25

Human Subjects Protection 25

Table of Contents—Continued

METHOD

Setting 25

Apparatus 25

Task 26

Independent Variables 27

Safety Information 27

Observer Presence/Absence 27

Performance-Contingent Termination of Observation 28

Choice Contingency 28

Removal of Termination Contingency (No Termination) 29

Integrity of the Independent Variables 29

Definition of Dependent Variables 30

Safety Performance 30

Productivity Measure 31

Percentage of Work Sessions Terminated 31

Measurement of Dependent Variables 32

Inter-observer Agreement 32

Experimental Design 33

Procedures 33

Introductory Session 33

Information Phase 34

Information and Observer Presence 34

Information, Observer Presence, and Performance-Contingent Termination Phase 35

Table of Contents—Continued

METHOD

Information, Observer Presence, and No Performance-Contingent Termination 38

Choice Phase 39

Debriefing Session 40

RESULTS 40

Safety Performance 41

Productivity Performance 44

Sessions Meeting Termination Criteria 46

Safety Performance 46

Productivity Performance 47

Interval-by-Interval Performance Comparison 49

Safety 49

Productivity 50

Reliability 51

Safety Performance 51

Productivity 52

Measures of Independent Variable Integrity 52

Observation Procedures 52

DISCUSSION 54

Key Findings 57

Rohn and Austin (2003) Was Not Replicated 57

Behavior Change Evoked by Goal Not Termination 59

General Discussion 59

Table of Contents—Continued

DISCUSSION

Separating Evocative Effects of Stimuli 60

Potential Confounds 61

Safety/productivity Goals 61

Feedback 63

Reactivity to Observer Presence 64

The Behavioral Function of Work Monitoring 66

Observer Presence as an S^D for Punishment 69

Observer Presence as a CEO-R 70

Conclusion 71

APPENDICES 71

A. Participant Recruitment Script 72

B. Script for Consent Process 74

C. Consent Form 76

D. Human Subjects Institutional Review Board (HSIRB) Approval Letter 79

E. Transcript of Recorded Voice Prompt 81

F. Safety Information Handout 83

G. Data Collection Sheet 85

H. Workstation Adjustment Log 87

I. Work Session Script for Information Phase 89

J. Script for Observation Sessions During Information and Observer Presence Phase 91

K. Script for Observation Session During Contingent Termination Phase 93

Table of Contents—Continued

APPENDICES

L. Script for Use During Choice Phase 95

M. Participant Exit Interview 97

N. Participant Debriefing Script 99

O. Safety & Productivity Performance Participants 1 through 10 102

BIBLIOGRAPHY 113

LIST OF TABLES

1. IOA Safety-related Dependent Variables 52

LIST OF FIGURES

1. Average safe performance for arm position. Closed data points represent intervals in which an observer was absent. Open data points represent intervals in which an observer was present 43

2. Productivity performance across phases for participants 7 and 8. Closed data points represent intervals in which the observer was absent. Open data points represent intervals in which the observer was present 45

3. Productivity performance across phases for participants 9 and 10. Closed data points represent intervals in which the observer was absent. Open data points represent intervals in which the observer was present 45

4. Across-phase comparison for safety performance of the percentage of observation sessions that met termination criteria 47

5. Across-phase comparison for productivity performance of the percentage of observation sessions that met termination criteria 48

6. Within-subject, interval-by-interval comparison of safety performance across phases for participants 1 through 6 50

7. Within-subject, interval-by-interval comparison of safety performance across phases for participants 7 and 8 51

8. Within-subject, interval-by-interval comparison of safety performance across phases for participants 9 and 10. Participants 9 and 10 were not exposed to the No Termination phase. 51

INTRODUCTION

What constitutes effective and ineffective supervisory behavior is unclear, in spite of its acknowledged importance (Komaki, 1986). To a large extent, theories of management do not provide specific information on what supervisors or managers should say and do to increase the probability that employees will achieve objectives beneficial to an organization (Brewer, Wilson, & Beck, 1994). Recognizing this deficiency, Komaki, Zlotnick, and Jensen (1986) developed an operant-based taxonomy and observational instrument known as the Operant Supervisory Taxonomy and Index (OSTI). The focus of this approach is the measurement of exactly what supervisors say and do while they are on the job. Although all supervisor performance can be categorized into one of seven major behavioral categories, the key components of OSTI are: (a) performance antecedents (i.e., events that occur before behavior such as providing instructions), (b) performance monitors (i.e., collecting employee performance data), and (c) performance consequences (i.e., events that follow performance such as indicating knowledge of performance). Thus, the OSTI differs from more traditional measures of supervisory effectiveness such as psychometric testing, post-hoc analyses of verbal reports, or survey descriptions of supervisory behavior provided by their superiors, peers or subordinates (Brewer, Wilson, & Beck, 1994; Komaki, 1986).

The OSTI has proven to be a reliable and sensitive measure of supervisory behavior (Komaki, 1986; Komaki & Minnich, 2002; Komaki, Zlotnick, & Jensen, 1986). Field tests of the OSTI have revealed that a key difference between effective and

ineffective supervisors is the extent to which they engage in work monitoring (e.g., Komaki, 1986; Komaki, Desselles, & Bowman, 1989). More specifically, effective supervisors engaged in a specific *type* of work monitoring: work sampling (Komaki, 1986; Komaki, Desselles, & Bowman, 1989; Brewer et al., 1994). Effective supervisors did not rely on self-reports or secondary sources to gather measures of employee performance – effective managers observed employees while they worked. For example, Komaki (1986) found that work monitoring was a key factor in differentiating insurance managers who were rated as "effective" or "marginally effective" by their superiors. Effective managers spent significantly more time collecting performance information on their subordinates via work sampling than their less effective counterparts. Although both effective and marginally effective managers engaged in similar activities (e.g., discussing work, delivering consequences, talking about performance with employees), the key differentiator between effective an ineffective managers may be the extent to which work sampling enables the delivery of performance consequences.

In a study conducted with sailboat skippers, Komaki, Desselles, and Bowman (1989) found that work sampling and consequences delivered by skippers correlated significantly with competitive series standings. In other words, skippers who collected performance data typically finished ahead of their peers in competitive boat races Moreover, skippers who gave feedback on when tasks were being executed correctly or incorrectly were more likely to win races. While it must be noted that a correlation between (a) work sampling and consequence delivery, and (b) series standings does not mean the former causes the latter – effective skippers could be engaging in several other behaviors that positively effect the outcome of the race – an implication of the Komaki et

al. (1989) study is that knowing the extent to which supervisors engage in work sampling and delivering consequences may have value in predicting the effectiveness of those supervisors.

While field testing the generality of OSTI with police patrol sergeants, Brewer et al. (1994) found that (a) supervisors spent less time providing antecedents (i.e., instructions, rules, and goals) and consequences (i.e., feedback), and more time monitoring performance than supervisors in other settings (i.e., insurance, newspaper, and banking industries), (b) supervisors on higher performing teams spent more time monitoring performance and providing neutral performance consequences than supervisors on lower performing teams, and (c) team performance was related to the time supervisors allocated to activities that provided opportunities for monitoring the performance of subordinates. Thus, there appears to be a consistent, albeit small, body of research suggesting the significance of work sampling as it pertains to supervisor effectiveness.

Komaki and Citera (1990) attempted to go beyond the OSTI by examining the process associated with one of its key performance measures – performance monitoring – and by working within an interactional hypothesis. The intent of this study was to determine why work monitoring might distinguish effective managers from their less effective peers in two previous field tests of OSTI (Komaki, 1986; Komaki et al., 1989). The reason for this extension of OSTI, as stated by Komaki and Citera (1990) was that, "Specifying *what* an individual should do in a given situation is only one step in the scientific process. Documenting *why* the individual should engage in a particular set of actions is another critical, yet often neglected step" (p. 91). Komaki and Citera (1990)

hypothesized that performance monitoring initiated a series of events that were both reciprocal and performance-related, where the actions of the superior were expected to influence the subordinate, whose actions would then prompt further action by the supervisor. In this experiment, a monitor group in which supervisors sampled work was compared with an antecedent group in which supervisors communicated information to employees prior to performing work. Komaki and Citera (1990) found that (a) subordinates in the monitor group discussed their own performance more often than the antecedent group, (b), superiors in the monitor group provided performance consequences more often than the antecedent group, and (c) supervisors in the monitor group discussed their *own* performance more often than the antecedent group. Thus, the impact of work sampling on effective supervision appears to be a result of subordinates talking about their own performance as a result of being monitored, which in turn prompted supervisors to provide consequences and subsequently monitor performance (Komaki & Citera, 1990).

Generally, the research directed toward the identification of effective supervisory behavior initiated by Komaki and colleagues has suggested that effective managers (a) gather information on the performance of subordinates by observing them at work and (b) deliver consequences more effectively as a function of work sampling. The work conducted by Komaki and Citera (1990) sheds some light on the function of work monitoring as an initiator of reciprocal performance-related events occurring between supervisor and subordinate. Thus, not only has work monitoring been indicated as an important behavior related to supervisory effectiveness, but important information regarding *how* work monitoring contributes to that effectiveness has been suggested.

Another factor that could contribute to the relative effectiveness of work monitoring is a change in employee performance as a function of the presence of a supervisor engaging in work sampling activities. This change in performance as a result of being aware of ongoing assessment is known as the reactive effect of obtrusive assessment (Kazdin, 1982). In the context of work sampling, reactivity to the presence of a supervisor is not a completely undesirable state of affairs. An increase in an employee's frequency of desired responses as a function of work sampling gives the supervisor an opportunity to provide consequences for those responses. While there is some debate as to whether the supervisor is observing an accurate sample of performance (Kazdin, 1982; Rohn & Austin, 2003), it is impossible for a supervisor to provide performance-contingent consequences without monitoring the performance of interest. Thus, reactivity may have a critical role in determining the effectiveness of work monitoring procedures because it provides a basis for the delivery of consequences that support desired performance.

To echo the sentiments of Komaki and Citera (1990), however, simply demonstrating employee reactivity to work sampling is only the first step in the scientific process. If reactivity contributes to the effectiveness of work sampling, then an investigation into *why* reactivity occurs is warranted. Komaki and Citera (1990) were not satisfied with the simple identification of work sampling as a key indicator of effective supervision; they wanted to know why work sampling was so integral to effective supervision. That is, they investigated the function of the work sampling process. An investigation into the function of the presence of a supervisor conducting work sampling adds another level of analysis to their investigation. It is not sufficient to know that the

performance of employees is reactive to the presence of a supervisor conducting work sampling. We should be interested in discovering *why* work sampling produces that reactivity. Under what conditions are we likely to observe reactivity, and what is the mechanism that makes observation effective in producing behavior change? The following sections will review research examining the effects of observation, and present research that suggests the function of work sampling by an obvious observer.

Social Facilitation

Much research directed towards examining the effects of observation has been conducted by social psychologists, who characterize the effect of observer presence to be one of social facilitation. Social facilitation is the oldest experimental paradigm in social psychology, and is based on research conducted by Triplett (1898) who investigated the effects of the mere presence of other individuals on pacing and competition (Zajonc, 1965). There are hundreds of studies examining social facilitation, and a review of those studies is beyond the scope of this paper (see Geen & Gange, 1977; Guerin, 1986, 1993; and Zajonc, 1965, 1980 for comprehensive reviews). Instead, this section will provide a brief survey of hypothesized causes of reactivity from a social psychology perspective.

Generally speaking, social facilitation concerns the effects on behavior caused by the presence of others (Guerin, 1986), often referred to as "conspecifics" in social facilitation literature. Zajonc (1965) suggested that the presence of conspecifics could increase general drive level, resulting in a facilitation of dominant responses (i.e., simple tasks, or complex tasks already in the repertoire of the performer) and the suppression of subordinate responses (i.e., complex tasks, or tasks not in the current repertoire). Zajonc (1965) suggested that the presence of a conspecific increases "drive" or "arousal levels"

because of the uncertainty of the conspecific's behavior). It is generally accepted throughout social facilitation literature that the increase in arousal level occurs because a response is typically required in the presence of a conspecific (Cacioppo, Rourke, Marshall-Goodell, Tassinary, & Baron, 1990). Effects thought to occur in the presence of another person include increased apprehension due to an expectation that the person will evaluate (Cottrell, Wack, Sekerak, & Rittle, 1968; Henchy & Glass, 1968); cognitive or physical conflict resulting from participants trying to attend to the task and being distracted by the person present (Baron, Moore, & Sanders, 1978); increased effort from trying to make a good self-presentation to the person present (Bond, 1982); and an increase in conforming to public and private norms due to increased self-attention caused by the presence of the person (Carver & Scheier, 1981a, 1981b).

A key element of Zajonc's (1965) social facilitation model holds that the mere presence of a conspecific (i.e., the presence of another person with no threat of evaluation) is sufficient to produce social facilitation effects. However, after conducting an exhaustive review of the social facilitation literature, Guerin (1986) found that only 13 of the 85 studies that purported to examine mere observation effects actually investigated the effects of mere observation as described by Zajonc (1965), and only 6 of those 13 studies found evidence of a mere presence effect. Thus, the veracity of Zajonc's (1965) argument that mere presence is sufficient to produce facilitation effects remains in question.

Guerin (1986) did find that among those 85 studies, 34 of 39 investigations in which the person present was an *experimenter,* a facilitation effect was evident. These studies were excluded from the review of the literature on "mere presence" because

experimenters may be evaluative (Bond, 1982; Guerin, 1986) because they "know" what is expected of subjects, and will evaluate the performance of the subject during or after the subject has completed an experimental session. Of the five studies that did not demonstrate a social facilitation effect, the experimenter was not in a position to evaluate the participant, but was merely present in the room (e.g., the experimenter was engaged in another task in the same room or was not in a position to observe the participant).

Thirty-four studies did have the experimenter observing the participants, and *all* of these studies found facilitation effects. In the context of work sampling, *who* is doing the sampling appears to be a good predictor of the occurrence of social facilitation effects. It may not be that participants change their behavior as a function of a perception of uncertainty on the part of the observer as Zajonc (1965) suggested, but rather because of an increase in the probability that the observer will evaluate their behavior. Thus, behavior change may occur because of perceived *certainty* of evaluation based on its historical correlation with the presence of a superior (or someone else familiar with the work, who can make evaluations).

Guerin (1986, 1993) suggested that the robust effects observed when an observer is present may be attributable to the fact that a greater possibility for observation and evaluation exist when the experimenter is the evaluator. An additional factor that could account for those robust effects is an increase in the probability that the observer will deliver *consequences*. Social facilitation may result from a behavioral history in which persons who have held positions of relative authority have had control over reinforcing or punitive consequences, and delivered them after observing some performance. As described above, a higher probability of evaluation generally results in a change in

behavior, which could suggest a historical correlation between the presence of an evaluator and the delivery of pleasant or unpleasant consequences. Similarly, Guerin (1994) suggested that people expect to receive negative, rather than positive, evaluations from others, and respond in ways to avoid negative evaluation. In fact, social facilitation literature seems to show a generalized effect of compliance to avoid the delivery of negative consequences in the presence of others (Guerin, 1993, 1994).

In the framework of social facilitation, Guerin (1994) suggested participants perform differently when another person is present in order to avoid negative consequences from the audience. However, Kazdin (1982) suggested that people exposed to obtrusive assessments respond in ways they believe will make the experimenter like them. Ferris, Beehr, and Gilmore (1978) have also suggested participants change their behavior in social facilitation experiments to gain social approval. Curiously, the current review found that in spite of the wide body of research conducted to examine the effects of observer presence on performance, none were directed toward empirically investigating the function of observer presence itself. Given the number of hypotheses readily available to explain social facilitation (Guerin, 1993), it seems logical to conduct empirical investigations to test the validity of those hypotheses. Yet it has been noted (Kazdin, 1982; Guerin, 1994) that neither of these explanations (i.e., Ferris, Beehr, & Gilmore, 1978; Guerin, 1986) for the impetus of social facilitation has been tested in the specific context of direct observation of behavior.

If, as Guerin (1986, 1994) suggested, participants change their behavior to avoid negative consequences when another person is present, an unpleasant, or aversive stimulus function of observation is indicated. If this is the case, experimental conditions

can be arranged in such a way to allow participants to terminate the presence of the other person. If the participant works to avoid the presence of another person, then we begin to provide support for the negative evaluation hypothesis and, consequently, can begin to rule out other possible stimulus functions of observer presence. Conversely, if participants change their behavior to gain social approval, as suggested by Ferris, Beehr, and Gilmore (1978), experimental procedures could be so arranged such that the level of performance results in the presence of an observer. The current review has found no studies directed toward examining the function of the presence of an observer employing this methodology.

Work Sampling and Reactivity

A number of studies conducted by behavioral psychologists have demonstrated differential levels of performance as a function of obtrusive observation (e.g., Hay, Nelson, & Hay, 1977; Mercatoris & Craighead, 1974; White, 1977). Some examples of reactivity behavior to work sampling practices will be presented here. While a comprehensive review of this phenomenon is beyond the scope of this paper, selected studies here will give an overview of the phenomenon of reactivity to observation in general, and reactivity of work behavior to work sampling in particular.

Belfiore, Mace, and Browder (1989) examined the effects of experimenter surveillance on reactive self-monitoring (SM) of two mentally impaired women using a multi-phase reversal design. During baseline the participants, Ana and Eileen, were observed while working during 10-minute sessions. The dependent measure for Ana was the rate per minute of forks bagged or correctly placed on a jig. For Eileen, the dependent measure was the number of pages photocopied per minute. Following

baseline, both participants were trained to accurately self-monitor their work products. Subsequent to training, both participants were exposed to both the SM: Alone and SM: Observer-present conditions of the experiment. In the SM: Alone condition, the participants were instructed to self-monitor each product completed during their work session using their self-monitoring devices. A concealed video camera was used to measure session length and self-monitoring accuracy for both participants. The SM: Observer-present condition differed from the SM: Alone condition only in the presence or absence of an observer during the entire work session. No communication was exchanged between the participants and the observer throughout the session. The general results for both Ana and Eileen were that both participants produced more work units in the SM: Observer-present condition than when they were in the SM: Alone condition.

In another study examining reactivity to observation, Rusch, Menchetti, Crouch, Morgan, and Agran (1984) assessed the work behavior of five mentally impaired dishwashers. In the first phase of the experiment, special educators (SEs) overtly observed the on-task behavior of the participants. In the second phase of the experiment, SEs observed the same participants' work behavior overtly while a second group of observers posing as kitchen laborers assessed work when SEs were absent. In the final phase, SEs and coworkers assessed the participants' behavior concurrently. The results of the study indicate that the participants were on task more when SEs were observing them, and spent less time on task when SEs were absent. When the same participant was observed at the same time covertly and overtly, the covert measures covaried with the SEs measures of work performance.

Olson and Austin (2001) demonstrated reactivity to overt observation in a study that employed a multiple-baseline-design-across-behaviors to examine the effects of a self-monitoring package on safe performance of bus operators. In this study, four bus operators self-monitored their safe performance and received daily graphic feedback based on their own self-monitoring data. The participants self-monitored by estimating twice daily their safe performance on four safety targets using a self-monitoring form. Dispatch supervisors prompted participants to complete self-monitoring forms and also conducted special observations of the participants to measure performance on safety targets. Unknown to the dispatch supervisors and participants, experimental observers measured the performance of each participant by riding on the buses as passengers. The self-monitoring intervention resulted in a 12.5% increase for the group, with individual increases in performance ranging from 3% to 41% for specific safety targets. Additionally, all participants responded systematically to supervisor probes. For example, the performance of Participant 1 during supervisor observations was about 20% higher than his performance on the same day without supervisor presence. Similarly, participant 4 scored almost 40% higher on complete stops when the supervisor was present compared to his performance measured the same day without the presence of a supervisor. This study demonstrated reactivity to self-monitoring and differential levels of safety performance as a function of the overt presence of an observer, but did not examine why supervisor probes resulted in behavior changes.

In a study specifically designed to examine the immediate effects of observation on office safety behavior, Rohn and Austin (2003) used a hidden camera to monitor the performance of participants immediately prior to, during, and immediately following

observation. During the study, participants were exposed to three phases: (1) Information, (2) Information and Observation, and (3) Information, Observation, and Feedback. Throughout all phases of the experiment, participants performed a typing task during 25-minute work sessions. Data for each session were plotted in five 5-minute intervals to allow the examination of intra-session performance. During the Information Phase of the study, participants reviewed an information sheet with descriptions of behaviors related to performing office work safely (i.e., the dependent variables) for five minutes before they began a work session in which they performed the typing task alone for the entirety of the session.

During the Information and Observation phase, participants were exposed to a 5-minute observation period that took place during minutes 6 – 10 of the experimental session. Participants were told which dependent variables were being observed, but were not given feedback on their performance following observation. The observer left the workroom immediately following observation. The Information, Observation, and Feedback phase of the study was identical to previous phases except the participant received feedback on how safely he or she had performed each behavior during the 5-min observation period.

The general findings of the experiment were (a) mean safety performance of participants during 5-minute observation intervals was 70%, whereas mean safe performance during intervals when the observer was absent was 43%; (b) increases in safe performance observed during observer-present intervals deteriorated rapidly during observer-absent intervals; (c) in most cases, feedback generally did not improve safe performance of participants during observer-present or post-observation intervals; and (d)

in cases where safe performance appeared to be positively impacted by feedback, the performance deteriorated rapidly following the departure of the observer from the work setting.

The studies summarized above have demonstrated differential rates of performance as a function of the presence/absence of an observer. These changes in performance resulting from work sampling provide some insight as to why supervisors who engage in work sampling tend to be more effective than those who do not. Supervisors who conduct work sampling may be more likely to deliver consequences as a result of monitoring employees (Komaki et al., 1989), and the presence of an observer appears to evoke desired behavior. Thus, managers who provide consequences following work monitoring are likely to strengthen desirable behavior evoked by their presence.

Physiological Indicators of the Function of Observer Presence

A number of studies conducted to examine the effects of observer presence on physiological measures suggest an aversive stimulus function of observer presence. Martens (1969a, 1969b, 1969c) found that palmar sweat (PS) was clearly greater among participants who performed a complex motor task in front of a visible audience than among participants who worked by themselves. Droppleman and McNair (1971) found a gradual buildup in PS level among participants who first anticipated then delivered a speech into a tape recorder while a single experimenter was present to observe them. Singerman, Borkovec, and Baron (1976) reported cardiac acceleration in participants as a function of observation by an audience. Chapman (1973, 1974) found that participants manifested higher levels of muscle tension while listening to a recording in the presence of an experimenter than when they listened to the recording alone, regardless of whether

the experimenter was physically present or concealed behind a screen. Larkin, Ciano-Federoff, and Hammel (1998) found higher heart rate reactions for participants engaging in an anagram task when an observer was present than when working alone. Thus, the mere presence of another person can produce physiological arousal.

While the physiological responses described here are discussed in the context of aversive-control, it must be noted that these same responses could be elicited by the presentation of reinforcing stimuli. For example, the sight of a "long-lost" friend, winning the lottery, or eating a gourmet meal could produce similar responses. Additionally, the introduction of a novel stimulus into a relatively static (i.e., boring) work setting may also elicit some of these physiological responses. Nonetheless, in spite of the ample amount of research conducted to examine the effects of observation on performance and physiological responses, an examination of why the presence of an observer produces these effects has yet to be conducted.

Work Sampling and Behavior Based Safety

Behavior-Based Safety (BBS) (Geller, 1996; Krause, 1997; McSween, 1995) is a strategy to improve occupational health and safety that relies heavily on the identification and monitoring of key behaviors and systems factors. McSween (1995) argues that the greatest contributing factor to a safety process of maximum efficacy is the "regular observation of safe practices" (p. 103). McSween's argument is based on the work conducted by Komaki et al. An implication of this research is that an improvement in the nature of the observation process may result in a corresponding increase in the efficacy of a safety process – this is important given the fact that the success of the BBS process

relies so heavily on work sampling. Therefore, research directed toward improving the components of the observation process becomes a matter of practical significance.

What is the Function of a Behavior-Based Safety Observation?

Krause (1997) and McSween (1995) often refer to an employee-driven observation process, where workers observe the safe performance of their peers. Employee-driven safety processes are intended to be a holistic initiative, derived from the work of employees, developed by employees, and used to improve employee safety. This is in contrast to the status quo, where management hands down policies, or rules, intended control employee behavior. In an employee-driven process, the safety performance of workers is observed by peers, who then provide feedback following safety observation. Observers often announce their presence before the observation, to promote the values of openness and respect for the employee (Geller, 1996; Krause, 1997; McSween, 1995). In general, the employee-driven observation process is intended to improve safe behavior while attempting to change the function of the observation process from something that is generally unpleasant, to a more positive – or at least neutral – experience. Thus, we replace the face of the Orwellian boogeyman of social control, *Big Brother*, with something slightly less sinister: one's coworker.

But what if the observer really functions as *Big Brother* in coworkers' clothing? Social psychology research cited previously suggests people find observation generally unpleasant. What if the term "employee-driven observation process" is really a "consumer-oriented spin on a procedure whose dark, aversive-control underbelly" (Malott, 1999, p. 77) would be revealed upon closer inspection. What if calling the observation process "employee-driven" is a strategy that "allows us to slip an effective

procedure...by an aversive-control phobic" (Malott, 1999, p. 77) populace? Is it more practical to change the way we talk about aversive-control procedures, or to change the stimulus function of those procedures to something pleasant, or at least neutral? If the result is injury reduction, *does it matter* if people generally find being observed pleasant or unpleasant?

How workers perceive the presence of an observer will likely impact the initial success of the observation process. If the presence of an observer is an aversive stimlus, workers will likely work to avoid it; if the presence of an observer is a reinforcing stimulus, they may be more likely to seek it out or engage in behavior that produces evaluator-presence. Determining the function of the presence of an evaluator may allow us to determine the amount of front-end work needed to sell the observation process to employees, union, and/or management personnel. If observation is a reinforcing or neutral stimulus, perhaps very little front-end work is needed. Conversely, if it is an aversive stimulus – as results of physiological research suggests it is – then safety consultants can plan their entry strategies accordingly. For example, one of the problems associated with punishment-based procedures is the fact that workers will only perform their work long enough to avoid punishment (Daniels, 1989). Additionally, if the presence of observer is an aversive stimulus, people will work to avoid that condition altogether. In the context of BBS, strategies to associate some outcome useful to the worker (e.g., identifying and removing systems factors preventing safe performance) with the observation process would be indicated if observation was found to be aversive (Olson, Laraway, & Austin, 2001).

The Role of Functional Assessment

Changing the stimulus function of observation first requires a determination of that function, and there is some debate over the importance of taking performance problems to that level of analysis (see Normand, Bucklin, & Austin, 1999, and Malott, 1999 for a dialogue on this issue). Malott (1999) argued that a proper conceptual analysis of the function of stimuli is probably less important than a demonstration of their effectiveness, as it relates to the consumer. At the same time, Normand et al. (1999) argued the practitioner might be able to build more effective performance improvement interventions given the proper conceptual analysis of the function of interventions. The argument seems to stem from the challenges of reconciling the goal of science – figuring out how the world works, or as Malott (1999) stated, determining "how this causes that" (p. 79) – with the goals of practice (i.e., developing cost-effective interventions of maximum efficacy). These goals are not mutually exclusive, as new developments in science often benefit practice, and practical applications of science often generate additional questions to be researched. At the same time, they are not mutually inclusive; as it is often the case that one of these goals must be emphasized at the expense of the other.

Austin et al. (1999) argued for the need for the assessment of maintaining variables in the field of Organizational Behavior Management (OBM). They note that while functional assessment – an assessment of the contingencies responsible for behavioral problems (Malott, Whaley, & Malott, 1997) – has become best practice in the field of Applied Behavior Analysis (ABA), neither practitioners nor researchers in the field of OBM routinely engage in functional assessment activities in any formal way.

Yet, in spite of this fact, a great number of OBM interventions seem to be effective without a formal assessment of maintaining variables (Austin et al., 1999). Michael (1993) has suggested that the most important reason for success in OBM is a scientific orientation that is supported by a powerful research methodology. Michael (1993) suggested that this orientation allows the practitioner to be, "...successful irrespective of the incompleteness of available theory and irrespective of verbal practices are that are possibly inappropriate" (p. 93). Thus, there is no question that OBM interventions have been, and will likely continue to be, effective in spite of the lack of formal assessments of maintaining variables. It is also likely, however, that OBM interventions could be *more* effective if an analysis of those variables is conducted prior to intervention (Austin et al., 1999; Normand et al., 1999).

Determining the function of observer presence through functional assessment may increase the efficacy of work sampling procedures by allowing a *function-based* approach to improving work-monitoring practices. If the function of observer-presence is known, then we can make better decisions as to how we can (a) maximize the benefits of that function, or (b) mitigate it's undesirable effects.

Possible Behavioral Functions of Observer Presence

Given the relevant literature and theory on the effects and causes of social facilitation and reactivity, the possible stimulus functions of observer presence can be discussed. Within the social facilitation literature, research seems to show a general relationship between the effects of observer presence and the potential for evaluation of performance (Guerin, 1994). Social psychologists attribute the cause of this phenomenon to evaluation apprehension (Rosenberg, 1969). That is, people change their performance

because they are concerned that that "their performance will be used to evaluate their abilities, personal characteristics, or adjustment" (Kazdin, 1982, p. 9). In behavioral terms, the presence of other people has been highly correlated with the delivery of reinforcing and aversive consequences, and the presence of other people evokes (or suppresses) a response (or response class) because of that correlation – suggesting a discriminative function of observer presence. Additionally, because of a correlation between observer presence and reinforcing/punishing consequences, the presence of an observer could function as a generalized conditioned reinforcer (Malott et al., 1997) or generalized conditioned punisher (Malott et al., 1997) that increases or suppresses the future frequency of behavior it follows. As a conditioned punisher, the onset of observation would also evoke behavior that has terminated or avoided the stimulus condition in the past. These stimulus functions will be discussed in more detail below.

Observation as a Discriminative Stimulus (S^D) for Reinforcement

Malott et al. (1997) describe a discriminative stimulus (S^D) as a stimulus in the presence of which a particular response will be reinforced or punished. The presence of an observer would become an S^D for reinforcement if reinforcers were delivered for responses when the observer is present, and were not delivered for the response when the observer is not present (S^Δ). This arrangement is analogous to the social facilitation theory offered by Ferris et al. (1978), in which people change their performance in order to receive social approval. In the presence of an observer, we would expect a person to engage in responses that were reinforced when an observer had been present in the past, but not when the observer was absent.

Observation as a Discriminative Stimulus (S^D) for Punishment

The presence of an observer would become an S^D for punishment if aversive stimuli were delivered for responses when the observer was present, and were not delivered for responses when the observer is not present (S^Δ). This arrangement is analogous to the "evaluation apprehension effect" (Henchy & Glass, 1968; Rosenberg, 1969), in which people change their behavior (i.e., engage in responses that have not been punished in the past when an observer was present) to avoid negative evaluation. In the presence of an observer, undesirable responses are punished, resulting in a decrease in the frequency of those responses when the observer is present in the future. When the observer is not present, undesirable responses are not punished. According to Daniels (1989), people exposed to this arrangement will engage in desired behavior (or desired frequencies of behavior) only long enough to avoid punishment. An analysis of why this may occur is presented below.

Observation as a Motivative Variable

If the presence of an observer is consistently correlated with punishment, and thus becomes an S^D for punishment, the presence of an observer may come to function as a warning stimulus (Malott et al., 1997) because it precedes the onset of some aversive stimulus (or stimuli). The person being observed can terminate the warning stimulus and avoid the delivery of the aversive stimuli it has been associated with by engaging in some appropriate response. As a result of a correlation with punishment, the onset of the warning stimulus (i.e., the presence of an observer) may function as a reflexive conditioned establishing operation (CEO-R), a learned stimulus condition that establishes

its own removal as an effective form of reinforcement (Michael, 1993). Unconditioned and conditioned establishing operations – often referred to as UEOs and CEOs, respectively – have two main effects: (1) they momentarily increase or decrease the reinforcing or punishing effectiveness of stimuli (i.e., reinforcer/punisher-establishing effect), and (2) they momentarily alter the current frequency of all behaviors that have preceded those stimuli in the past. In the context of behavior-based safety, observer-presence as a CEO-R would (a) increase the momentary effectiveness of observer *absence* as a form of reinforcement, and (b) increase the current frequency of all behavior that has resulted in the termination of observer presence. Explaining the effects of observation in terms of Michael's (1993) taxonomy of motivative variables is a behavioral approach to interpreting Zajonc's (1965, 1980) account for the effects of the presence in which he attributed facilitation effects to increased "drive," and "arousal."

What is the Behavioral Function of Observer Presence?

A number of possible stimulus functions of observer presence have been presented here, and while the list is not exhaustive, it is clear that effects produced by the presence of the observer seem to be compatible with descriptions of a number of functions. Guerin (1994) pointed out that it has been difficult to arrive at any conclusion as to why the presence of an observer changes behavior because previous work has not included experimental manipulations that would distinguish between behaving in ways that (a) have been consequated by social approval and (b) engaging in behavior that has avoided disapproval. Whereas there are data that suggest the function of observer presence, the question of the function of observer presence has yet to be investigated empirically.

The current study was designed to investigate the behavioral function of observer presence. Social psychology experiments detailing the physiological effects of observer presence, as well as behavior-analytic studies suggest the presence of an observer to be an aversive stimulus, however the behavioral effects of observation are compatible with descriptions of several stimulus functions. If the presence of an observer is conceptualized as an aversive event, or form of worsening, CEO-R (Michael, 1993) and S^D for punishment functions of observer presence are tenable. As discussed previously, if observation functions as a CEO-R, a person who is being observed will likely work to terminate the observation. If the presence of an observer functions as an S^D for punishment, it is likely that a person will respond in ways that have avoided punishment when the observer was present in the past. Alternatively, if the presence of an observer functions as a reinforcer, a person will not engage in responses that would result in the removal of the observer, and would engage in responses that result in the presence of an observer.

The current study examined the effects of observation by systematically and contingently manipulating the presence and absence of an observer. The behavioral function of observer presence was tested by an experimental condition that allowed participants to terminate observer presence contingent upon meeting or exceeding a safety or production performance goal. As an additional assessment procedure, participants were also allowed to choose between observer-present and observer-absent conditions following the contingent termination phase.

METHOD

Participants

Participants were eight female and two male undergraduate students (N = 10) enrolled in undergraduate psychology courses at a small Midwestern college. Participants ranged in age from 19 to 24 years, and were paid $5.00 per hour of participation in the study.

Participant Recruitment

An announcement (see Appendix A) was made during various undergraduate psychology courses until ten participants had volunteered. Participants were selected based on their availability during the study, with the requirement that they had not suffered a repetitive stress injury, or symptoms of a repetitive stress injury.

Consent Process

The consent process was initiated prior to the start of each participant's first session. The student investigator (SI) read both a script (see Appendix B) that explained the consent process and the consent form (see Appendix C) aloud to the participant. The participant was given the opportunity to either sign the form (i.e., agree to participate in the study) or withhold his or her signature (i.e., refuse to participate). Participation in this study did not begin until the participant read and signed the consent form.

Duration

Each session was approximately 25 minutes in duration, consisting of a 5-minute information period followed by a 20-minute work session. Participants were allowed to complete a maximum of two sessions per day, with a minimum break of 30 minutes between sessions.

Human Subjects Protection

This study was approved by the Human Subjects Institutional Review Board (HSIRB) (see Appendix D for a copy of the approval letter).

Setting

The study was conducted in a laboratory facility located on the campus of a large Midwestern university. Two 12 × 8 foot observation rooms in a building on campus were used for the study. The observation rooms were outfitted with an adjustable office chair, a four-legged workbench, and an adjustable foot rest (Safeco model SAF2106). Four plastic bins, numbered one through four, were placed on the workbench to store completed work products produced during experimental sessions. The arrangement within the observation room simulated that of a manufacturing workstation.

Apparatus

The performance of participants during all sessions was recorded on videotapes via a wireless hidden camera (X10 Wireless Technology, Inc., Xcam2). The wireless camera relayed a signal to a wireless receiver (model VR36A X10 Wireless Technology,

Inc.) attached to a Panasonic AG 1320 4-head videocassette recorder located in a video surveillance/recording room.

Task

During the 20-minute work period of all experimental sessions, participants engaged in a simple assembly task. Participants assembled "widgets" for the duration of each work session. Assembly of the work product (i.e., widget) involved affixing two nuts and one washer to a hex-bolt. Participants placed finished products in one of four plastic bins, numbered one through four. The work bins were stacked sequentially with Bin 1 on top of the stack, and placed in front of the participant to facilitate productivity and safety performance. Work products were placed in Bin 1 during minutes 1 through 5 of the work session, Bin 2 during minutes 6 through 10, Bin 3 during minutes 11 through 15, and Bin 4 during minutes 16 through 20.

A voice recording (Appendix E) prompted each participant to switch work bins. The audiotaped voice recording was played on a portable cassette player (model TC-M929 Sony), which was started by the SI or RA at the beginning of the work portion of the experimental session. The audiotape was 20-minutes in duration and prompted participants to switch work bins every five minutes. Ten seconds after each voice prompt, a follow-up prompt again indicated the bin in which work products should have been placed. The purpose of the work bins was to allow for the tracking of production performance during specific intra-session intervals, which was necessary for experimental procedures described later in this paper.

Independent Variables

Participants were exposed to each of the following conditions: (a) safety information, (b) observer presence/absence, (c) performance-contingent termination of observer presence, and (d) a choice arrangement in which participants could choose to have an observer present during work sessions, or to work alone. Eight of ten participants were exposed to a fifth experimental condition intended to separate the effects of the performance goal and termination of observation. The two main independent variables were the presence and absence of an observer, and the presence and absence of the termination contingency.

Safety Information

During the first five minutes of experimental sessions in the safety information condition, participants were given a safety information handout (Appendix F). The safety information consisted of definitions of the safety targets measured during the study.

Observer Presence/Absence

During the observer presence/absence phase, an observer was present to monitor the performance of the participant during a 10-minute observation period. The 10-minute observation period began following the first five minutes of the work session, and was terminated five minutes prior to the end of the work session.

Performance-Contingent Termination of Observation

During the performance-contingent termination phase, participants were allowed to terminate the 10-minute observation period after only five minutes (i.e., five minutes early) if they met a safety or productivity goal specified by the SI or RA during the first five minutes of the original 10-minute observation phase. As recommended by Daniels (1989), goals were based on the historical performance of each participant. Goals for a participant were set by examining the performance of that participant during the first five minutes of observer-present intervals in previous work sessions. The procedure used to set safety and production goals was similar to that used by Wilk and Redmon (1990), where the goal selected for each participant was 10% above the highest level of performance observed during previous observer-present sessions. In cases where participant safety performance during the first five minutes of observation was at near-zero levels, a safety goal of 33% was set. The safety goal for participants was set based on the facts that (a) all participants demonstrated correct performance of safety targets prior to beginning the study and (b) most participants performed the safety targets correctly during initial sessions in the information phase.

If the performance of the participant did not meet the goal criterion, the observer continued to monitor the participant until the 10-minute observation period was concluded.

Choice Contingency

The fourth independent variable was a choice arrangement in which, prior to each session, the participant was given the option to either (a) choose to have an observer

present to monitor his or her performance for ten minutes, or (b) choose to decline the observation session. Additional details on the Choice arrangement are provided in the "Procedures" section of this paper.

Removal of Termination Contingency (No Termination)

This phase of the experiment was identical to the Performance-Contingent Termination Phase except for the following difference: participants exposed to this arrangement were not able to terminate the presence of the observer even if he or she met the criteria for termination. Each participant who was exposed to this phase was told that the performance goal applied only to the first five minutes of the observation, and that the observation would continue irrespective of performance. In other words, the performance criteria were made known to the participant and applied only to the first five minutes of observation, but the termination contingency was no longer operative.

Integrity of the Independent Variables

To ensure that all participants were exposed to the same instructional set, scripts were developed for all verbal instructions that were delivered to the participants by the researchers. Researchers used videotapes of experimental sessions to verify the presence of observers, and recorded the time interval in which the observer entered and left the observation room. Participants were also required to sign each safety information sheet to verify exposure prior to beginning all work sessions.

Definition of Dependent Variables

The dependent variables in this study were the (a) level of safety performance recorded for four behavioral safety targets, (b) a production measure based on the number of work products completed during each 5-minute block within a 20-minute experimental session, (c) the percentage of work sessions in which performance levels of either (a) or (b) met criteria for early termination of the presence of an observer when a termination contingency was in effect, and (d) a comparison of within-session pre- and post-observation performance measures.

Data on safety performance and production performance collected during each phase of the experiment were plotted in 5-minute blocks. Average safety and productivity performance during one five-minute block constituted one data point within each 20-minute work session. Thus, for each class of dependent variable, one work session was comprised of four within-session data points.

Safety Performance

Four safety targets based on ergonomic guidelines for manufacturing (Helander, 1995) served as measures of safety performance. The level of performance for each safety target was recorded in the form of a percentage. A "percent safe" score was calculated by dividing the number of intervals observed as "safe" by the number of intervals observed as "safe" plus "unsafe," and multiplying by 100. The individual safety targets were defined as follows:

1. *Back Upright* — Spine parallel to the back of the chair; angle of the back and the thigh between 90 and 100 degrees while seated

2. *Shoulders Aligned with Back* — Shoulders aligned with the back; not slouched or curved forward
3. *Arms* — Angle inside of elbow between 90 and 100 degrees
4. *Leg Position* — Angle inside of knee and ankle between 90 and 100 degrees

The workstation was adjusted for each participant, according to ergonomic guidelines for manufacturing (Helander, 1995), prior to all experimental sessions to minimize obstacles in the environment that might prevent safe performance.

Productivity Measure

The productivity measure was the number of work products produced during each 5-minute block within the 20-minute experimental session. Participants assembled "widgets" for the duration of experimental sessions. For the purposes of the current study, the completed work product (i.e., widget) consisted of a hex both with two nuts and one washer affixed to it (i.e., a nut – washer – nut configuration).

Percentage of Work Sessions Terminated

A percentage of work sessions in which safety or production performance levels met criteria for early termination of the presence of an observer when a termination contingency was in effect was calculated for each phase of the experiment. This percentage was derived by dividing the number of sessions in which observer presence was terminated early by the total number of sessions within the phase where the termination contingency was operative. This percentage was compared to the number of sessions in which observer presence *would* have been terminated had the contingency been operative during previous phases.

Measurement of Dependent Variables

Each session was videotaped using a hidden camera placed within the observation room. Each session was scored at a later time using the videotape of each participant's performance. The SI or RA used a data sheet (see Appendix G) to record participant performance data. Data were collected using a 20-second whole-interval recording procedure, in which each behavior was scored as "safe" only if it met criteria specified on the data sheet throughout the entire interval. A behavior was scored as "unsafe" if it failed to meet the criteria for safe performance at any time during the interval. A goniometer (Sammons Preston #7510) was used to determine whether dependent variables requiring angle measurements (i.e., back upright, arms, and leg position) were scored as safe or unsafe.

Data collected during each phase of the experiment were plotted in five-minute blocks for each dependent variable. Average safe performance during one 5-minute block constituted one data point the within each 20-minute work session. Thus, one work session was comprised of four within-session data points.

Inter-observer Agreement

Point-by-point inter-observer agreement was assessed during 42% of all sessions for each dependent variable for all participants. The SI scored sessions independent of an RA, and inter-observer agreement was calculated by dividing the number of occurrences by the number of occurrences plus non-occurrences, multiplied by 100.

Experimental Design

The current study employed a within subject, multi-element design, with a non-concurrent multiple baseline (Watson & Workman, 1981) across participants. A non-concurrent multiple baseline design across participants was selected for this study because Rohn and Austin (2003) observed response covariation for several behaviors when they examined the immediate effects of observation using a multiple baseline across behaviors design.

Procedures

Introductory Session

Students who volunteered to participate in the current study attended an introductory session. At the beginning of the introductory session, either the SI or RA initiated the consent process described in the Participants section of this proposal. After the participant signed the consent form, the SI or RA explained the work task and procedures to the participant. Participants were trained to assemble widgets, and then assembled a widget to demonstrate mastery of the task. Either the SI or RA explained the relevance of the work bins, and played a sample of the audio prompt for the participant.

Participants were then asked to sit at the workstation. The SI or RI adjusted the workstation to fit the participants based on ergonomic guidelines for manufacturing (Helander, 1995), and then recorded the workstation settings on a data sheet (see Appendix H).

Information Phase

During each session in the Information Phase, participants were given an information sheet (see Appendix F) containing definitions of the safety behaviors described previously. The participant was instructed to (a) review the information sheet for the next five minutes, and (b) to sign the handout to verify that he or she had been exposed to the safety information. Following each participant's *first* exposure to the handout, the SI or RA (a) modeled each target behavior, (b) asked the participant to demonstrate each target behavior following modeling, and (c) delivered corrective feedback to the participant if he or she was observed performing a target behavior incorrectly. The modeling, participant demonstration, and corrective feedback component described here was not delivered again during the experiment.

Following the 5-minute information period, participants began the 20-minute work session. The SI or RA instructed participants to work at their own pace for 20 minutes (see Appendix I). At the end of the session, the SI or RA recorded the number of widgets completed during each 5-minute interval on a data sheet (Appendix G). The SI or RA scored safe performance of the participants with a data sheet (Appendix G) by observing videotapes of the participants' performance during experimental sessions.

Information and Observer Presence

The intent of this phase of the experiment was to replicate systematic changes in participant safety performance related to the presence/absence of an observer, as demonstrated in the study conducted by Rohn and Austin (2003). This phase was identical to the previous phase of the experiment except that an observer was present to

monitor the participant's performance during a 10-minute observation period that occurred between 5:01 and 15:01 of the 20-minute work session. Some additional differences are described below.

Each observation period began immediately following the first five minutes of each work session. The observer began the observation period by announcing his or her presence at the beginning of the 10-minute observation period. The observer announced that he or she would be monitoring the participant's performance for the next ten minutes, but did not specify which performances would be monitored. The observer also informed the participant that he or she was not allowed to communicate with the participant during the observation session. A script (see Appendix J) was used to ensure the integrity of the instructional set. The observer faced the participant and sat four feet from the participant's left side during the observation period.

Immediately following the 10-minute observation period, the observer instructed the participant to continue to work for the remainder of the session and then the observer left the work area. There was no communication with the participant other than the announcements delivered at the beginning and end of the observation period.

Information, Observer Presence, and Performance-Contingent Termination Phase

The intent of this phase was to examine the behavioral function of observer presence. The procedures in this phase were identical to previous phases, with the exception of differences that will be described here.

During this phase, participants were allowed to terminate the observation period five minutes early if he or she met either (a) a safety goal, or (b) a production goal. The

type of goal that was set for each participant depended on his or her performance during previous experimental sessions.

To ensure observers measured performance in 20-second intervals during "real-time" observations that will be described in this section, the observers used headphones to listen to a taped voice recording of verbal prompts for data collection. The audiotape cued observers to record safety data. After the first five minutes of the observation session, the observer told the participant if he or she met the criterion level, and either terminated or continued the observation.

Safety goal. Participants who did not perform their work safely (i.e., those who averaged less than 60% safe during the Information and Observer Presence phases) during observer-absent and observer-present intervals were exposed to a safety goal. If the participant met the safety goal after five minutes of observation, the observation period was terminated. If the participant did not meet the goal, the observer remained in the room for the entire 10-minute observation period. The safety goal was based on the performance of the participant during the first five minutes of the 10-minute observer-present intervals within previous experimental sessions. One of the four safety targets for each participant was targeted by this phase of the study. The SI selected the dependent variable that presented the greatest opportunity for improvement (i.e., the dependent variable for which safety performance was the lowest), and did not target any of the remaining dependent variables.

Prior to each session in this phase, the observer told the participant that he or she could terminate the observation session if he or she met a safety goal during the first five minutes of the observation session. The participant was told that the goal was based on

his or her safety performance during previous observation sessions. The observer informed the participant that his or her safety performance on one of the safety targets would be evaluated fifteen times during the observation period, and told the participant the number of times out of fifteen that a safety target had to be performed safely to meet the termination criterion. The participant was also told that if the safety goal was not met, the observer would continue to monitor performance until the 10-minute observation period concluded. A script (see Appendix K) was used to ensure the integrity of the instructional set.

Production goal. The production goal served as a contingency plan in the event that safety performance of a participant suggested a ceiling effect. Given that dependent variables for safety were presented in the form of a percentage, it was possible that participants would perform well enough during observer-present and observer-absent intervals to preclude the establishment of effective safety goals. While the whole interval recording of dependent variables relevant to safety was intended to mitigate the probability of ceiling effects, the potential for their occurrence was still a possibility. If a ceiling effect were observed for safety performance, it would have been difficult to establish attainable performance goals that would have resulted in the termination of the work session, and thus provide a basis for examining the function observer presence.

A production goal was implemented to intervene on the behavior of participants whose safety performance demonstrated a ceiling effect, which presented those participants with an opportunity to terminate the observation period early. The production goal was based on the performance of the participant during the first five minutes of the observation period of all previous experimental sessions. Thus, a

production goal was set from 5:01 – 10:01 of experimental sessions during this phase. If the participant met the production goal during that period, the observation session was terminated. If the goal was not met, the observation continued for the entirety of the 10-minute observation period.

Prior to each session in this phase, the observer told the participant that he or she could terminate the observation session after five minutes if he or she met a production goal during the first five minutes of the observation session. The participant was told that the goal was based on their production performance during the first five minutes of previous observation sessions. The participant was also told that if the safety goal was not met, the observer would continue to monitor performance until the 10-minute observation period concluded. A script (Appendix K) was used to ensure the integrity of this instructional set.

After the first five minutes of the observation session, the observer told the participant if the goal was met, and either terminated or continued the observation. A script (Appendix K) was used to ensure the integrity of this instructional set.

Information, Observer Presence, and No Performance-Contingent Termination

This phase of the experiment was designed to attempt to separate the effects of goal-setting with termination of the observation session. Eight of ten participants were exposed to this phase, and it was implemented in cases where time and resources permitted. This phase was identical to the Information, Observer Presence, and Response-Contingent Termination phase, except for the fact that participants would not be able to terminate the observation session early if they met the goal. That is, participants were told prior to the session that no matter how they performed, the

observation would continue for the full 10-minute observation period. Goals for each participant were the same as their goals during previous phases, and like previous phases, the goals pertained only to the first five minutes of the 10-minute observation period. Thus, if the participant met the goal, the observation continued; if the participant did not meet the goal, the observation continued. Researchers used a script to ensure integrity of the instructional set.

Choice Phase

In this phase, participants were allowed to choose between observer-present and observer-absent conditions. Prior to experimental sessions in this phase, participants were given the option to either: (a) choose to have an observer present for ten minutes during their work session, or (b) decline the observation period. A script (see Appendix L) was used to ensure integrity of the instructional set delivered during this phase. If participants failed to meet the production or safety goals, and consequently fail to terminate the observation session, it could have been argued that participants desired observation because they did not work to escape observation. The Choice phase was implemented under the following conditions: (a) a participant did not consistently terminate observation sessions or, (b) a participant did consistently terminate the observation session and time and resources permitted implementation. The choice arrangement was implemented to gather additional information on the function of observer presence.

If participants choose one stimulus condition over another after being exposed to both conditions (i.e., observer presence versus observer absence), we can infer a preference for one condition. It can be further inferred that the selected stimulus

condition has greater reinforcing value – or is at least less aversive than the non-selected condition – because the participant makes a response that results in the "preferred" condition. Thus, if participants choose to be observed during experimental sessions, it suggests observer presence is functioning as a form of conditioned reinforcement. Conversely, if participants choose to work alone (i.e., observer absence), it suggests observer presence functions as a form of conditioned punishment. The procedures described in this phase were identical to previous phases except for the choice arrangement described above.

Debriefing Session

Following the last experimental session for each participant, the experimenter conducted an exit interview (see Appendix M for a copy of the interview) to gather additional information regarding the function of observer presence. Immediately after the exit interview, the experimenter explained the purpose of the study to the participant (see Appendix N for the debriefing script) and answered participant questions.

RESULTS

Descriptive statistics including within-phase means, standard deviations, and ranges for both targeted and non-targeted dependent variables for each participant across all phases can be found in Appendix O. The dependent variable targeted for participants 1 through 6 was arm position. The dependent variable of interest for participants 7 through 10 was productivity performance. In general, dependent variables that were static in nature were performed quite well throughout the study and were not directly targeted by the interventions described herein (i.e., the possibility of establishing safety

goals was precluded by a ceiling effect). It is likely that the fact that each participant's workstation was adjusted to mitigate equipment issues that would prevent safe performance was responsible to a great extent for this observation. However, the current study did not employ a "true" baseline condition, which limits the extent to which we can comment on the effects of workstation adjustment. Participants whose productivity performance was targeted during intervention either performed all dependent variables at levels that did not lend themselves to the development of effective goals (i.e., participants 7, 8, and 10), or did not demonstrate stability of performance for any dependent variable (i.e., participant 9).

Safety Performance

The effects of the intervention procedures described in this study can be found in Figure 1. As shown by Figure 1, arm position was the sole targeted dependent variable for all participants (i.e., participants 1 through 6) who were exposed to interventions intended to impact safety. Arm position was selected for these participants because it was the dependent variable that represented the greatest opportunity for improvement for all participants. The nature of the targeted dependent variable was likely the key factor in determining its selection for intervention, as arm position was the most dynamic behavior in the targeted response class. This is in contrast to posture-related behaviors such as back position, shoulder position, and leg position – behaviors that were fairly static, and made more so because of workstation adjustments that fit the workstation to each participant.

With the exception of participant 6, all participants (i.e., five of six, or 83%) who were exposed to the safety goal met their performance goal and terminated the

observation session early during the first session in which the contingency was operative. After failing during the first session in the Termination phase, participant 6 did successfully terminate all subsequent sessions within the phase. For the most part, participants did not consistently perform the targeted dependent variable correctly, even though all participants had successfully demonstrated correct performance of the dependent variable prior to their first experimental session. During the No Termination phase, all participants except participant 1 continued to meet the termination criteria during all sessions within the phase, even though the termination of the presence of the observer was no longer available. Participant 1 met the termination criteria during the first of two sessions during the No Termination phase, but failed to meet the criteria during the final two sessions of the phase. Although two participants (i.e., participants 1 and 3) appeared to perform more safely only when an observer was present, four participants maintained levels of performance that were near levels of performance during observer-present intervals. During the choice phase, levels of performance for four of six participants returned to baseline or near-baseline levels, whereas two of six participants (i.e., participants 2 and 5) maintained levels of performance similar to those observed during the performance-contingent Termination and No Termination phases.

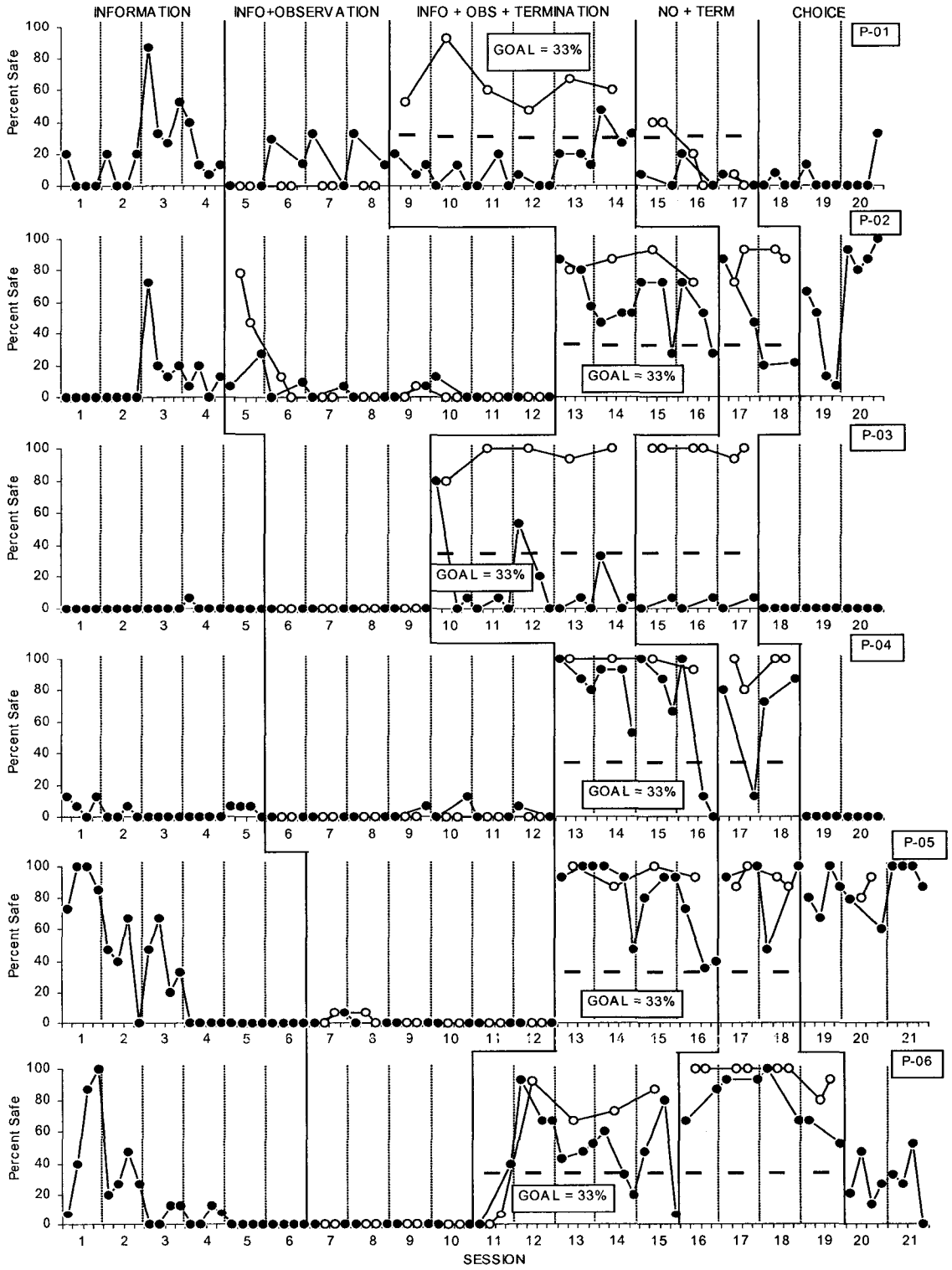

Figure 1. Average safe performance for arm position. Closed data points represent intervals in which an observer was absent. Open data points represent intervals in which an observer was present.

Productivity Performance

Figures 2 and 3 present the results of experimental procedures for participants 7 through 10. Experimental procedures employed for these participants were identical to those to which participants 1 through 6 were exposed, except the Termination and No-termination phases targeted productivity performance. During the Information and Observation phase, all participants except Participant 9 demonstrated higher levels of productivity performance during intervals in which the observer was present, compared to intervals in which the observer was absent. Participants 7, 8, and 10 (three out of four, or 75% of participants) successfully terminated all observation sessions in which the termination contingency was operative. Participant 9 failed to meet the criterion for termination during the first two sessions in which the contingency was operative, but did successfully terminate the final three sessions within the Termination phase. During the Choice phase, productivity performance of participants 7 and 8 were similar to those observed during Termination and No Termination phases. Productivity performance for participants 9 and 10 during the Choice phase returned to levels near those observed during phases prior to the Termination phase (participants 9 and 10 were not exposed to the No Termination phase).

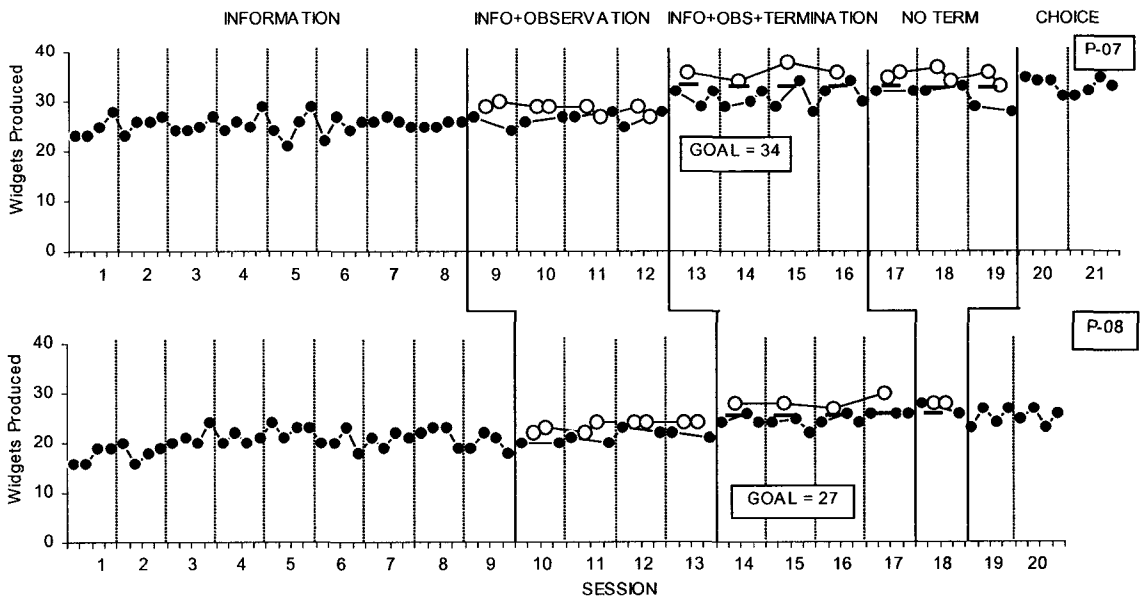

Figure 2. Productivity performance across phases for participants 7 and 8. Closed data points represent intervals in which the observer was absent. Open data points represent intervals in which the observer was present.

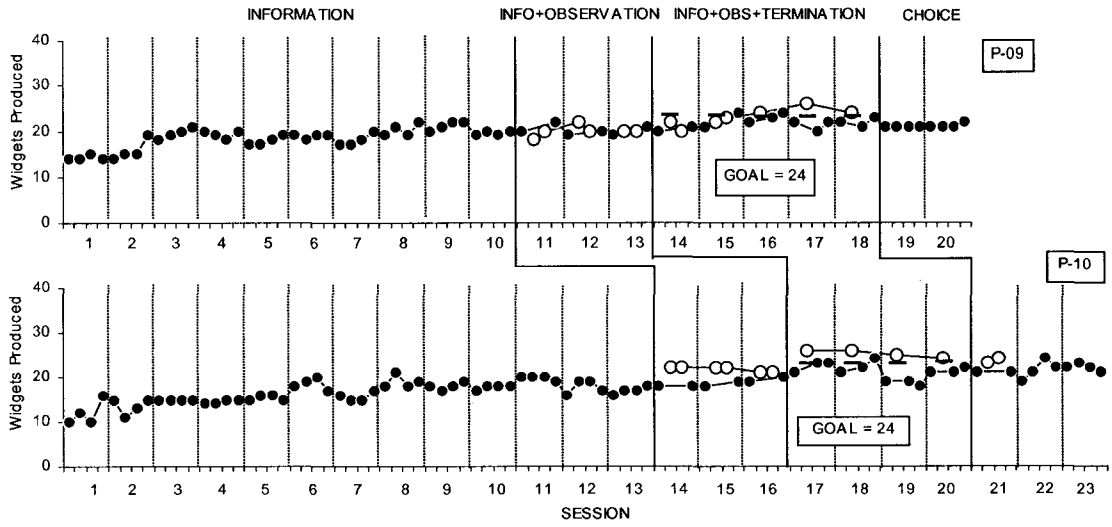

Figure 3. Productivity performance across phases for participants 9 and 10. Closed data points represent intervals in which the observer was absent. Open data points represent intervals in which the observer was present.

Sessions Meeting Termination Criteria

Safety Performance

An across phase comparison of the percentage of observations terminated during the experimental phase in which termination was available versus the phases in which termination was not an option was conducted for all participants, and is presented in Figures 4 and 5. In general, the percentage of observation sessions terminated during the phase in which termination was available far exceeded the percentage of sessions that *would have* been terminated in previous phases had the termination contingency been operative. In addition, the percentage of sessions that would have met termination criteria was much higher in experimental phases that followed the termination phase than in the initial phases of the study. The percentage of actual observation sessions terminated during the phase in which termination was available was 96% (i.e., 27 of 28 observation sessions terminated).

Information phase. Twenty percent of the sessions during the Information Phase would have been terminated had the termination contingency been operative.

Information and observer presence phase. Three percent of the sessions during this phase would have been terminated had the termination contingency been operative.

Information, observation, and no termination phase. Eighty-six percent of the sessions in the Information, Observer-presence, and No Termination phase would have been terminated had the termination contingency been operative.

Choice phase. In the choice phase, 40% of observation sessions would have been terminated had he termination contingency been operative.

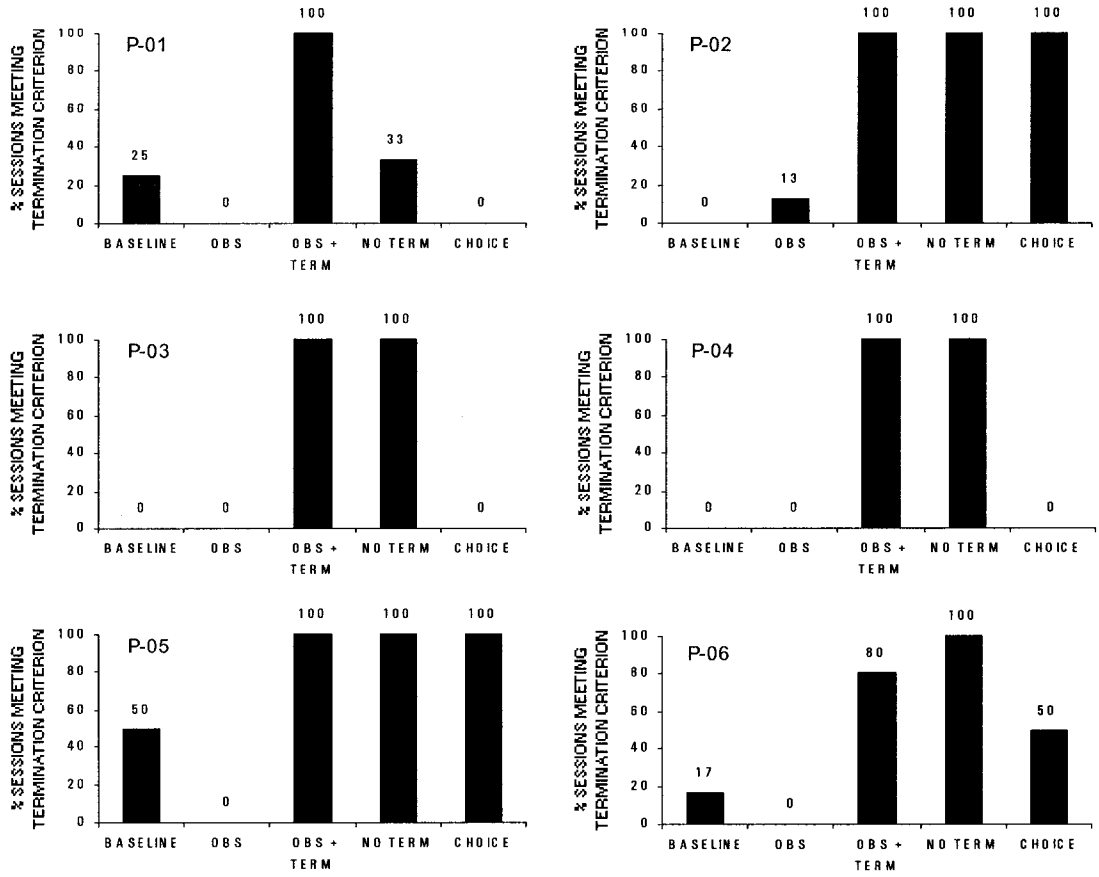

Figure 4. Across-phase comparison for safety performance of the percentage of observation sessions that met termination criteria.

Productivity Performance

Figure 5 presents the results for participants 7 through 10 (productivity performance). No sessions in the Information or Information and Observer-presence phases met the criteria for termination of the observation session because of the nature of the goals set during the Termination phase. Goals set during the Termination phase for each participant were ten percent higher than the highest level of productivity performance observed during the first five minutes of the 10-minute observation period in the Information and Observer-presence phase. Thus, the level of productivity

performance required to terminate the presence of the observer was one that had not been reached previously, making it impossible for performance in any of the prior phases to meet the criteria for early termination (had the contingency been operative during those phases). The percentage of actual observation sessions terminated during the phase in which termination was available was 82% (i.e., 14 of 17 observation sessions terminated).

Information, observation, and no termination phase. Of the two participants (i.e., participants 7 and 8) who were exposed to this phase, 100% of the observation sessions (i.e., 4 out of 4 sessions) would have been terminated early had the contingency been operative.

Choice phase. In the Choice phase, 30% (i.e., 3 of 10 total choice sessions) of observations would have been terminated early had the contingency been available during this phase. This percentage includes sessions in which the participant chose not to have an observer present.

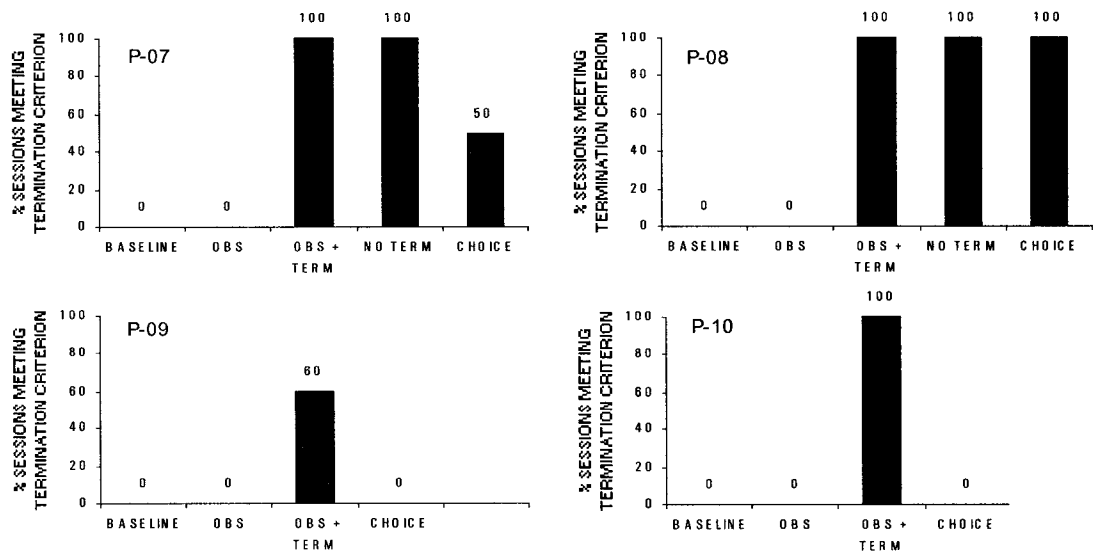

Figure 5. Across-phase comparison for productivity performance of the percentage of observation sessions that met termination criteria.

Interval-by-Interval Performance Comparison

Safety

Figure 6 shows an across interval comparison of performance for each participant, and allows a comparison of pre-, during-, and post-observation performance. An observer was present during intervals two and three (i.e., the second and third bars, respectively) throughout the Information and Observation phase; during interval two – and possibly interval three depending on participant performance – throughout the Observation and Performance-Contingent Termination phase (i.e., the second and third bars, respectively); during intervals two and three throughout the Observation and Performance-contingent Termination phase (i.e., the second and third bars, respectively); and during intervals two and three throughout the Choice phase if participants chose to be observed (i.e., the second and third bars respectively). Performance for all participants was generally low during the Information and Information and Observer-presence phases. For the Observation and Performance-Contingent Termination and the Observation and No Performance-contingent Termination phases, safety performance was typically higher during intervals in which an observer was present than when an observer was absent. Participant 4 was the only exception to this summary, as safety performance for this participant during Interval 1 (pre-observation) matched that of Interval 2 (observation) during the Observation and Performance-contingent Termination phase. During the Choice phase, 50% of the participants (i.e., participants 2, 3, and 6) maintained levels of safe performance observed during Termination and No-termination phases, or performed

at levels greater than those observed during the Information and Information and Observer-presence phases.

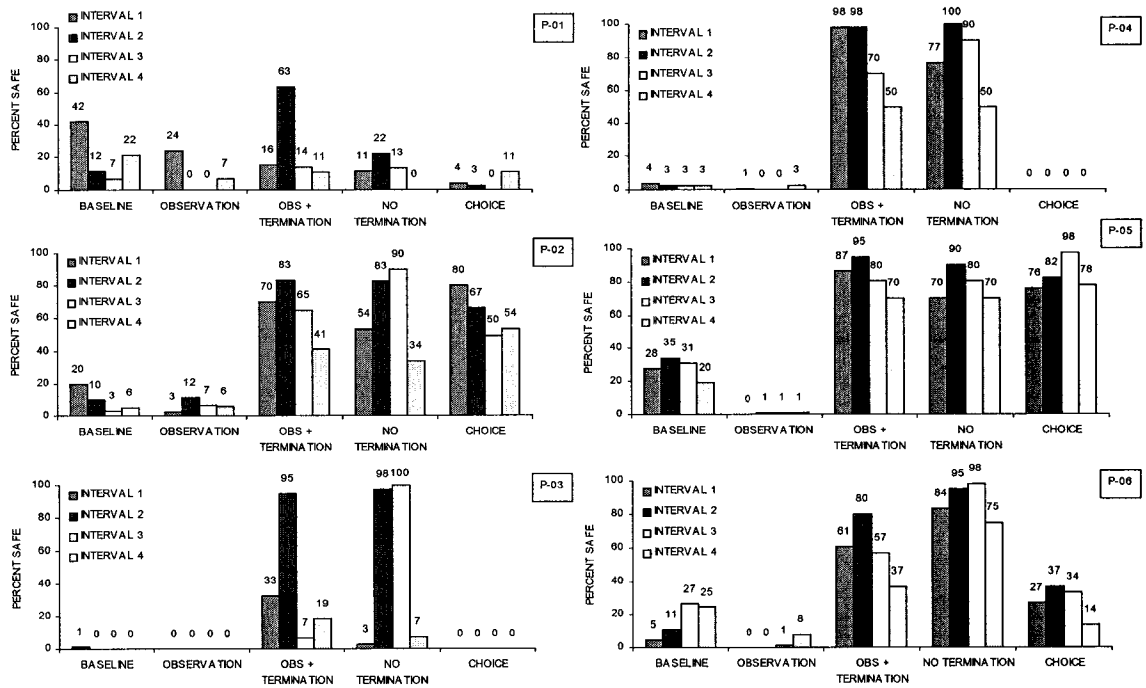

Figure 6. Within-subject, interval-by-interval comparison of safety performance across phases for participants 1 through 6.

Productivity

An interval-by-interval comparison of productivity performance for participants 7 through 10 can be found in Figures 7 and 8. A general observation of these data is an upward trend in productivity performance throughout each phase leading up to the Observation and Performance-contingent Termination phases for each participant. Three of four participants demonstrated increased levels of productivity performance when an observer was present during the Information and Observer-presence phase compared to when an observer was absent. Productivity performance of participants 7 and 8 was

greater during intervals when an observer was present, compared to intervals when an observer was absent during the Termination and No-Termination phases.

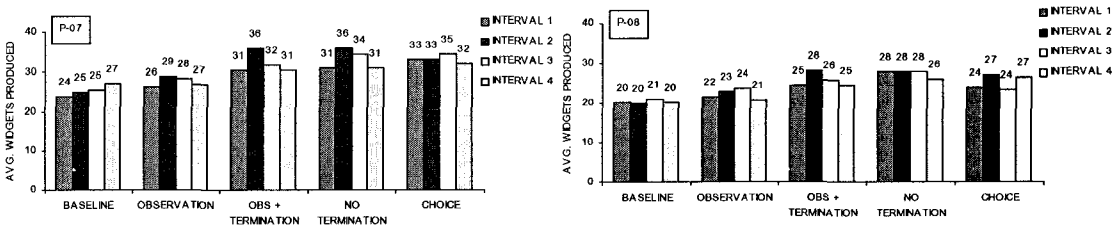

Figure 7. Within-subject, interval-by-interval comparison of safety performance across phases for participants 7 and 8.

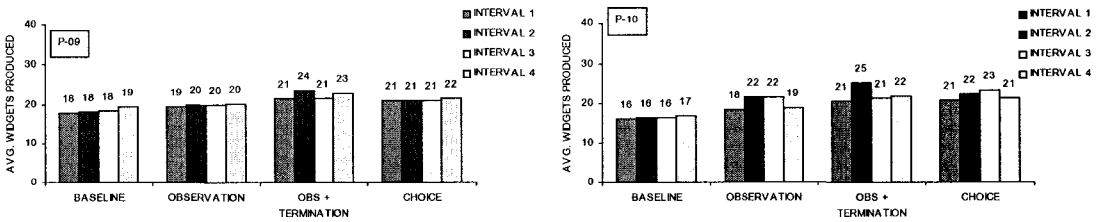

Figure 8. Within-subject, interval-by-interval comparison of safety performance across phases for participants 9 and 10. Participants 9 and 10 were not exposed to the No Termination phase.

Reliability

Safety Performance

Inter-observer agreement (IOA) was assessed during 42% of all sessions (i.e., 86 of 206 total sessions). Two independent observers simultaneously scored safety performance of participants during IOA sessions, and inter-observer agreement was calculated as follows: the number of occurrences divided by the number of occurrences plus non-occurrences, multiplied by 100. The average overall agreement across all dependent variables was 98% (range: 80% – 100%). Of 344 total IOA calculations

(i.e., 86 sessions × 4 dependent variables), none were under 80%. Table 1 shows ranges of IOA scores for each dependent variable over the course of the study.

Productivity

Inter-observer agreement for productivity was also assessed for 42% of experimental sessions (i.e., 86 of 206 total sessions). Two independent observers counted the number of widgets in each work bin following experimental sessions. Agreement across 344 IOA calculations (i.e., 86 sessions × 4 bins per session) was 100%.

Table 1

IOA Safety-related Dependent Variables

Dependent Variables	Average % IOA	Range % IOA	Sessions < 80%
Shoulders	99	82 – 100	0
Back	99	87 – 100	0
Arm Position	96	80 – 100	0
Legs	99	91 – 100	0

Measures of Independent Variable Integrity

Observation Procedures

Observer presence. The integrity of observer presence during experimental phases was measured for 42% of experimental sessions (i.e., 86 of 206 total sessions), and was checked in three ways. First, a reliability check was made to ensure that an observer was present during sessions in which an observer was planned to be present.

Two independent observers recorded on their data sheets (Appendix G) the time the observer entered the observation room, and the time the observer left the observation room. Observers also circled on their data sheets the interval during which the observer entered the room. These data sheets were then compared to job aids that tracked the experimental phases for each participant. An agreement was marked if the observers' data sheets demonstrated the presence of an observer when the job aid indicated an observer should be present. A disagreement was recorded if the observers' data sheets demonstrated the presence of an observer when the job aid did not indicate an observer should be present. A disagreement was also marked if observer data sheets indicated that an observer was not present when the job aid indicated that an observer should have been present. Independent variable integrity during all experimental phases except the Observation and Performance Contingent Termination phase was 100%.

Independent variable integrity for the Observation and Performance Contingent Termination phase was 98% (i.e., 44 out of 45 sessions). The lone disagreement resulted from session 9 for participant 1, in which participant 1 was exposed to observer-presence and the termination contingency when the participant should have remained in the Information and Observation phase.

Termination of observation. To measure the extent to which observation sessions were being terminated when performance of participants met termination criteria, the data sheets of video observers were compared to data sheets of "real-time" observers to ensure safety performance met criteria for termination. An agreement was scored if participant performance for both sets of data sheets met or exceeded the criteria for termination. A disagreement would have been marked had one data sheet within a set indicated that

termination criteria were not exceeded. Independent variable integrity for termination of observation was 100% for all phases in which a termination contingency was operative.

Safety information handouts. Participant exposure to the safety information handout was verified by matching the number of signed handouts for each participant to the number of experimental sessions in which they participated. Independent variable integrity for exposure to the information handouts for all participants was 100%.

DISCUSSION

Key Findings

Before an in-depth discussion of the behavioral function of observer presence is presented, it is instructive to review the key findings of the current investigation, in addition to a summary of the implications of each finding. In short, the key findings are as follows: (a) the effects of Rohn and Austin (2003) were not replicated – safety behavior of participants was not reactive to the mere presence of an observer; and (b) the collective results of phases 3 and 4 of the experiment (i.e., Termination and No Termination, respectively), suggest behavior change during the Termination phase was evoked by the verbal statement of the goal and not the opportunity to remove the observer from the room.

Rohn and Austin (2003) Was Not Replicated

In the current investigation, reactivity of safety behavior to the presence of an observer was not observed. Although this is disappointing from scientific perspective of validating experimental procedures of prior experiments (i.e., Rohn & Austin, 2003), the

failure to replicate has provided valuable information on the conditions under which reactivity is likely to be observed. The failure to replicate the results of Rohn and Austin (2003) suggests that four conditions are necessary for reactivity to occur: (1) the presence of an observer who can evaluate competent/incompetent performance, (2) the observer must be perceived to be in control of valued consequences, (3) the person being observed must be able to correctly perform the observed behavior (i.e., it must be in the repertoire of the person observed), and (4) *the person being observed must be able to tact the behavior that is being evaluated during observation.*

A minor change from the procedures Rohn and Austin (2003) allowed the discovery of the fourth condition. During the Observation phase of Rohn and Austin (2003), participants were told which behaviors would be observed during the observation period. In the current study, participants were told at the beginning of the study that the observer would be present to observed their performance. "Performance" in the context of the current study could have meant several things to the participants: (a) performance of the safety targets on the safety information handout, (b) productivity performance (i.e., number of widgets produced), or (c) some other behaviors relevant or irrelevant to work performance.

Although the modification to the observation procedures of Rohn and Austin (2003) were implemented to reduce the probability that ceiling effects would be observed for the purposes of effective goal setting, that same modification appears to be responsible for the "basement" effects observed for most participants during the Observation phase. The key distinction between the two studies is the ability of participants to tact the behavior being observed during the observation period – the

results of both studies suggest participants in Rohn and Austin (2003) could, whereas participants in the current study could not (presuming they were asked, which they were not).

Behavior Change Evoked by Goal Not Termination

The results of the No Termination phase suggest increases in safety and productivity performance during the Termination phase was due the verbal statement of a goal and not the statement o the termination contingency (i.e., "if you meet this goal, the observer will leave early). The data produced during the current investigation suggest the behavior of participants during the Termination phase was goal-directed, rather than the termination-directed. It might be useful at this time to remind the reader that the purpose of the No Termination phase was to separate the effects of goal setting from the termination of observer-presence. If participants reliably met the criteria for termination during Termination phase but failed to meet the criteria when the termination contingency was removed, then increases in behavior could be attributed to the termination contingency (presenting an empirical basis for aversive stimulus classification). This was not what happened during the current study. Participants continued to meet or exceed termination criteria even though termination was not longer available. Thus, the most parsimonious explanation for the observed changes in behavior during the Termination phase is that participants altered their performance to meet the goal and not to terminate the presence of the observer.

General Discussion

The current study provides an initial step toward discovering the behavioral function of work monitoring. The data suggest an aversive function of the observer's presence, but it is clear that the waters are still "murky" as far as assigning a specific behavioral function based on the available empirical evidence. A primary reason for the "murkiness" that surrounds the function of observer presence is the fact its function can vary depending on a person's history of reinforcement (or punishment) and/or current states of deprivation. In contrast to the painful physical stimulation produced by contact with high-voltage electrical current, the presence of an observer is not inherently aversive. As a physical stimulus, the presence of an observer can serve several functions, depending its history of conditioning.

It is not untenable to suggest that observer presence could function as a reinforcer, and it is not difficult to think of examples where this would be the case (e.g., a little league baseball player who receives feedback from his coach while he's being observed; an executive who is observed and coached to become a better speaker). Characterizing all situations in which an observer is present as aversive is probably painting with too broad a brush, however it is not untenable to suggest that people will find most situations in which an observer is present to be aversive. The function of observer presence likely depends on (a) consequences provided during or immediately following instances of observer presence in the past, (b) the context in which those consequences are delivered, and (c) the probability that the current observer will deliver consequences (i.e., whether the observer has control over valued consequences and the capacity to deliver them).

It is appropriate at this time to caution against assigning a global stimulus function to observer presence. Due to the nature of observer-presence as a functional stimulus, it is possible that it's function can very depending on the behavior or environmental context. The current study suggests observer-presence can function as an aversive stimulus for a specific behavior related to safety (i.e., arm position) in a specific environmental context (i.e., work setting with an observer present who is evaluating performance). As it pertains to the function of the observer-presence, explanations of the aversive function of observer-presence should be restricted to conditions employed during the current investigation. Further, the current study suggests that reactivity will be observed in only those situations in which the person being observed *can tact the behavior that is of interest to the observer.* It appears that a prerequisite to observing reactivity is the arrangement of conditions under which the person being observed can "tell" what is being observed at the time.

Additionally, whereas it appears observer-presence can function as an aversive stimulus for safety performances in a work setting, there are situation in which the presence of an observer is aversive but it is requested by the person to be observed. People might select observer presence on a rule-governed basis *even though it is an aversive stimulus* (i.e., observer-presence has been associated with punishing consequences for the person being observed). For example, it is often the case that a master's or doctoral candidate will request and even seek out the presence of observers for practice runs of their final presentations. Further, it is very possible that the prospective candidate expects the experience will be one that is aversive, and that receiving feedback from observers will be a punishing experience. However, the key

behavioral distinction in this case – for the presenter – is the control of observation selecting and seeking behavior by a rule statement. Specifically, if the master's/doctoral candidate's behavior is controlled by a rule similar to, "In spite of the unpleasantness associated with my colleagues observing my presentation and providing critical analyses, their feedback will improve my presentation and increase the odds of a successful defense," then we would expect that the candidate would ask for and seek out observers. This may also hold true in the context of executive development, where a manager requests an executive coach to provide critical feedback following observation that will ultimately improve his/her performance.

In general higher levels of safety performance were evident when an observer was present. Whereas this could suggest multiple explanations for the function of observer presence (e.g., S^D for reinforcement, S^D for punishment, CEO-R), participant choices during the Choice phase, in addition to exit interview responses indicate an aversive function of the presence of an observer. When given the opportunity to choose, eight of ten participants chose to work alone during all sessions within the Choice phase, rather than having an observer present to monitor their performance. During the Choice phase, 92% of sessions (i.e., 23 of 25) were sessions in which participants chose to work alone rather than have an observer present during the work session. The two exceptions were participants 5 and 10, though neither participant chose to have an observer present for more than one of three sessions in the Choice phase. Answers provided by participants 5 and 10 during their exit interviews provide some insight on why they chose to have an observer present during the Choice phase.

When asked why she chose to have an observer present during her second choice session, participant 5 said she thought the observer must have found the observation process just as awkward as she did, and chose to be observed because she thought the observer wanted to avoid observing her and she did not want to "let him off the hook." The comments of participant 5 suggest she chose to have an observer present not because observer presence was functioning as a reinforcer but because of the opportunity to control the behavior of the observer.

Participant 10 remarked that he chose to be observed because he thought that was what the experimenters wanted him to choose – this was in spite of the explicit statement made by experimenters prior to the choice opportunity indicating the experiment would not be adversely affected by his choice. When participant 10 was asked why he chose to work alone during the final two sessions of the Choice phase, he stated that that at first he didn't really believe that his decision would not adversely affect the study, but determined later on – presumably between sessions 21 and 22 – that his decision would not be detrimental to the experiment. Like participant 5, the comments of participant 10 suggest his choice to be observed was not because observer presence was functioning as a reinforcer, but because of demand characteristics of experimental sessions – in spite of the measures taken to mitigate those characteristics.

Separating Evocative Effects of Stimuli

While the data indicate participants did perform at higher levels during experimental sessions in which a termination contingency was operative – thereby resulting in the subsequent termination of the presence of an observer – separating the evocative effect of the safety/productivity goal and the presence of the observer is

somewhat problematic. To illustrate this point, 88% of participants who were exposed to the No Termination phase reliably met or exceeded the goal after they were given a goal and then informed that the observation session would continue for its full duration irrespective of performance. On its face, this state of affairs suggests the verbal statement of a performance goal by experimenters evoked higher performance levels from participants (i.e., greater frequency of safe behavior or widgets produced). That is, higher levels of performance may have been evoked because goal attainment has been followed by the delivery of reinforcers in past, rather than an observer whose presence functions as either (a) an S^D for punishment for unsafe or off-task behavior, or (b) reflexive conditioned establishing operation (CEO-R) that acquired its evocative power through pairing with punishing events.

Potential Confounds

Safety/productivity Goals

While the current study employed procedures intended to demonstrate specific behavioral functions of observer presence, there were confounds in the experimental procedures were problematic to that endeavor. The first confound relates to the goal setting component of the Information, Observation and Performance-Contingent Termination phase. In order for participants to work to escape observation sessions, criteria for each participant had to be derived from current levels of performance. Although it is possible to create an experimental arrangement with an arbitrary avoidance response (e.g., pulling a lever, which would result in the immediate termination of observer presence), the arrangement would not have been an approximation of an actual

work environment and thus offered less external validity. However, an arrangement such as the one described above could be employed to determine behavioral function of observer presence. For example, an analog to a basic research arrangement in which a rat is trained to press a lever that results in shock avoidance could be used. In the basic arrangement, a buzzer (i.e., warning stimulus) that precedes shock can be terminated by pulling a chain and, when the chain is pulled, the buzzer is terminated and the shock interval is reset (i.e., shock onset is delayed). In this arrangement, shock can be delayed indefinitely if the rat continues to terminate the warning stimulus by pulling the chain.

A human analog to the arrangement described above using the environment in the current study could involve placing a light above the worktable that precedes the onset of observation. The light would be synchronized with an identical light positioned over the door on the outside of the observation room, and would be visible to the observer. During an observer-present phase, the light positioned above the participant's workstation illuminates for ten seconds. After ten seconds elapse the observer would enter the room and begin monitoring the performance of the participant. In the termination phase, a switch that extinguishes the light would be made available to the participant (e.g., it is placed on the workstation table). Prior to the first termination phase, an experimenter would tell the participant that if he or she turns the light off when it illuminates, the observer will not be present during that session to monitor work performance. The contingency could be arranged to require multiple avoidance responses (e.g., the light illuminates every two minutes). If the participant reliably extinguishes the light and avoids observation, an aversive function of observer presence is suggested.

Feedback

A second potential confound inherent to the procedures of the current study that could account for performance increases during Termination phases relates to inadvertent delivery of performance feedback. To illustrate this point, participant 6 failed to meet the termination criterion for her first session within the phase. The fact that the observer remained in the room for the entirety of the session could have provided the participant feedback on her safety performance. Specifically, the fact that the observer did not leave indicated to the participant that she was not performing the dependent variable of interest safely enough to terminate the observation session. Further, the fact that participant 6 did not perform the dependent variable of interest safely suggests the behavior may not have been in her repertoire – she either did not "know" how to perform safely at all, or thought she was performing safely but received feedback to the contrary when the observer did not leave the room, and subsequently altered her safety behavior. Anecdotally, participant 6 was observed practicing arm position immediately after observation during the first session within the Termination phase (i.e., session 11), and immediately prior to the observer entering the workroom during the subsequent experimental session (i.e., session 12). Thus, the low safety performance appears to have been the result of "can't do" variables where the participant could not tact safe performance, rather than "won't do" variables where the participant could tact safe performance but effective motivative variables for safe performance of that behavior were not operative.

The motivative variable responsible for the increase in performance, however, remains unclear as it could have been attributed to the goal, the presence of the observer, or some combination of the two. An arrangement that may have separated those effects

would have been one in which the goal was still operative, but the observer never entered the room. If higher levels of performance persisted in the absence of an observer, it would suggest the goal as the primary variable evoking safe performance. However, it is possible that the behavior of the participant could have been motivated by suspicion that she was being observed covertly, as the rationale for setting a performance goal with the observer absent might suggest that she was, in fact, being observed by covert means. A debrief question inquiring as to the primary variable responsible for performance increases could uncover whether the participant thought she was being observed when an observer was not in the room.

Reactivity to Observer Presence

The results observed during the Information and Observation phase of Rohn and Austin (2003) were not replicated in the current study. This phase was included in the current study for the purposes of replication, and to support the argument for a CEO-R function of observer presence, as the nature of the CEO-R is to evoke all behavior that has terminated its onset in past (in this case it would have been safety behavior). During the Information and Observation phase employed in the study conducted by Rohn and Austin (2003), differential levels of safety performance were observed when the presence of an observer was systematically manipulated – participants performed more safely when the observer was present, but less safely when the observer was absent. Additionally, intervention on one behavior during the Information and Observation phase resulted in concurrent increases in safety performance for several other dependent variables. Thus, the presence of an observer served to evoke higher levels of safety performance for yet-to-be-intervened-upon dependent variables.

A factor that could account for the failure to replicate the effects of Rohn and Austin's (2003) study may be the difference in experimental procedures employed during the observation sessions of the current study. In Rohn and Austin (2003), participants were told which specific behavior was being observed when an observer was present. Although neither punishing nor reinforcing stimuli were delivered contingent upon the behavior of interest, participants could tact behaviors (i.e., back upright) being monitored by the observer during the observation session if they were asked to do so (i.e., they were "aware" of the specific aspects of their behavior being monitored), and could presumably generate rule statements to the effect of, "If I don't perform the safety behaviors correctly while the observer is watching me, the observer will be disappointed." The behavior of participants in Rohn and Austin's (2003) study could have been under control of the compound stimulus of observer-presence and self-generated rule statements of participants who could tact the behavior that was of interest to experimenters.

In contrast, participants in the current study were told prior to their first experimental session that their safety performance would be measured at some point during the study, but were not told which behaviors were being monitored. Specifically, experimenters told participants that observers would be monitoring their *performance* during the observation session. This arrangement may have produced less reactivity because participants did not "know" which performances were being monitored (i.e., they could not accurately tact specific performances monitored by the observer). For example, "performance" in the context of the current study could have been interpreted as either "safety" or "productivity," and indeed increases in productivity performance of participants 7 and 10 was observed when an observer was present during the Information

and Observation phase. Concurrent increases in safety performance were not observed for participants 7 and 10. This may have been the result of the ambiguity of the meaning of "performance" in the context of the current study. An additional factor that may have contributed to the failure of replication could have been that stimuli associated with productivity performance were more salient than those associated with safety performance. For example, after each session, participants could hear and see experimenters counting the number of widgets produced during experimental sessions. Thus, while there were no salient stimuli associated with the measurement of safety performance, participants were exposed to stimuli that suggested the "true" focus of the observation was productivity performance.

The Behavioral Function of Work Monitoring

The behavioral function of work monitoring is being brought into focus. Although it is difficult to pin a specific function on observer presence, the data produced in the current study do suggest an aversive function of observer presence that is consistent with evocative effects of an S^D for punishment and a CEO-R. The fact that eight of ten participants chose to work alone during all sessions of the Choice phase suggests the participants found observer presence aversive, as they responded to avoid it. Of the two participants who chose to be observed during the Choice phase, neither indicated during the exit interview that they made their choices because they found observer presence reinforcing. Several participants remarked during the exit interview that their performance improvements were "probably" due to both the performance goal and the presence of the observer. Although these comments make it difficult to attribute the performance improvements to the presence of an observer, the fact that no participant

chose to be observed during the Choice phase does suggest an aversive function of observer presence. An experimental arrangement that could separate the effects of goal setting and observer presence could involve a condition in which a performance goal is set for the experimental session, but an observer never enters the room (i.e., a "goal only" phase). The phase that follows would be goal setting plus observer presence. If the participant meets the goal during the "goal only" phase, the performance improvement could be attributed to the presence of the goal, and presumably a rule statement that governs the behavior explicit in the rule. If the participant's performance does not meet the termination criterion during the goal only phase, but meets or exceeds the criterion when the observer is present (and the goal is operative), it would suggest that the presence of the observer is the active motivative variable for observed improvements in safety or widget-making behavior.

The comments of participant 9 during the exit interview are worthy of note here. During the experiment, experimenters observed several occasions in which participant 9 appeared to look directly at the hidden camera. Anecdotally, the first time participant 9 looked at the camera he appeared to smile. These observations were confirmed when, in response to a question asked during the exit interview, he stated that he *did* see the camera and knew experimenters in another room were observing him. Interestingly, participant 9 chose to work alone during the Choice phase even though he knew he was still being observed. When asked why he chose to work alone despite knowing that he was being observed, he indicated a difference between certain observation when an observer was in the room, versus uncertain observation when an observer was not present. Participant 9 indicated there was a difference between, "being observed, and

being *observed*." Participant 9 also indicated that he worked at a local party store in which a closed circuit television system was in place to monitor the performance of cashiers and to prevent theft. Thus, he had habituated to the passive observation of the observation system, but found direct observation by his manager aversive.

When asked why he thought this was the case, participant 9 indicated that if he was off-task when the manager was present, he was likely to receive a reprimand (or some other punishing consequence), whereas when the manager was absent, it was unlikely that he would be punished for off-task behavior because it was improbable that the manager would watch the taped performance unless theft was a concern. If the current study paralleled Participant 9's actual work environment, it suggests his choice was due to prior experiences where an observer – presumably someone who controlled consequences – punished his behavior, and the absence of punishment when the observer was absent. Thus, a potential practical implication of this finding is that workers may find video observation procedures less aversive than active observation by one's coworkers, because they are more frequently exposed to video surveillance in their daily activities (e.g., while shopping and banking). An experimental arrangement that could investigate this implication is one in which participants are exposed to (a) a passive observation system such as a camera, and (b) direct observation by another person, and is then allowed to chose between the two conditions. Although it is probably unlikely in this case to argue that a condition will be selected because it is a reinforcer, it is likely that a condition will be selected because the participant finds it less aversive than the other.

Observer Presence as an S^D for Punishment

The selection of observer absence during the Choice phase suggests an aversive function of observer presence, and thus makes the classification of observer presence as an S^D for reinforcement ($S^{D\text{-}r+}$) untenable. If observer presence were functioning as an $S^{D\text{-}r+}$, it is likely participants would have made a response that produced the onset of the stimulus – in this case, selecting the observer-present condition when given the opportunity. An analysis of observer presence as an S^D for punishment ($S^{D\text{-}p+}$) appears to be a better fit for the current set of circumstances. It was previously argued that observer presence could function as an $S^{D\text{-}p+}$ for unsafe behaviors, resulting from a behavioral history in which the worker's unsafe behavior was punished, and behaving safely avoided punishment when the observer was present. The key distinction between an $S^{D\text{-}p+}$ and an $S^{D\text{-}r+}$, then, is that in the case of an $S^{D\text{-}p+}$, safe behaviors merely avoid punishment and unsafe behavior is punished, whereas safe behavior in the presence of an $S^{D\text{-}r+}$ is reinforced and unsafe behavior is not. Thus, in a behavioral safety setting, workers would perform more safely not because safe behavior was reinforced in the presence of an observer, but because the observer punished unsafe behavior. Because we do not have direct access to the history of conditioning of observer presence as a functional stimulus, inferences must be drawn from the data available that suggest the function of that stimulus. In the context of the current experiment, choices made by participants during the Choice phase are the strongest indicators of the functional properties of observer presence, especially because the observers themselves did not deliver consequences. It should be noted that without the benefit of a Choice phase, the pattern of participant

responding during previous phases would have been consistent with either an S^{D-r+} or S^{D-p+} stimulus function.

Observer Presence as a CEO-R

The behavioral effects of observer presence are also consistent with the those produced by a CEO-R. The onset of a CEO-R establishes its own removal as an effective form of reinforcement (Michael, 1993), and the nature of the CEO-R is to evoke all behaviors that have resulted in its offset in the past. In the context of the data produced during the current study, the data suggest safety/productivity behavior was evoked by the presence of an observer as a result of a behavioral history in which such behavior was reinforced by the observer leaving. That is, the observer left after finding nothing untoward during the observation. This situation is analogous to those in which workers behave in ways to "look busy" when the supervisor inspects their site, inasmuch as "looking busy" results in the supervisor leaving the site to proceed to another. However, without knowing the historical events that conditioned the function of observer presence, these effects are consistent with those produced by a stimulus function as an S^{D-p+}. Untangling S^{D-p+} and CEO-R functions is problematic in the context of the current study because participants were not allowed to terminate the presence of the observer immediately, as participants were always observed for a minimum of five minutes, irrespective of performance.

Anecdotally, three participants (i.e., Participants 1, 2, and 5) were observed practicing their safe behavior prior to the first observation session of the initial session in the *Termination* phase. It is not unreasonable to suggest that the rule stating the termination contingency evoked practice behavior, but determining which stimulus was

responsible for the practice behavior is difficult, as it could have been evoked by the termination contingency made effective by the (a) aversiveness of observer presence or (b) the statement of the goal itself. Finally, it was often the case that a participant would meet the criterion for termination of observer presence, but observation would continue for some amount of time following meeting the criterion (i.e., an extinction arrangement). Typically, responses evoked by the onset of a CEO-R result in the immediate offset of the stimulus, but in the current study, the relationship between safe performance and the observation termination was weakened by the delay in termination of observation.

Conclusion

The initial step toward uncovering the behavioral function of work monitoring has been made. The current study suggests an aversive stimulus function of observer presence in general, and provides some insight on the specific stimulus function that work monitoring might serve. Although the distinction between an $S^{D\text{-}p^+}$ and CEO-R function is difficult to make, an argument for an $S^{D\text{-}p^+}$ function appears to be the most tenable given the data produced by the experimental arrangements of the current study. Future experiments should focus on arranging conditions to make the distinction between the two evocative variables, as well as further exploring the tenability of a CEO-R function of observer presence, as the experimental arrangements in the current study certainly do not shut the door on that conceptualization. The current study provides an empirical basis for approaching workplace observation with caution, and provides a rationale for the development of observation procedures that provide value to those who are observed.

Appendix A

Participant Recruitment Script

PARTICIPANT RECRUITMENT SCRIPT

"Hi, my name is Don Rohn and I am conducting a research study. This study will serve as my dissertation. The purpose of my visit to your classroom today is to recruit participants. In order to qualify as a participant, you must be available this semester.

Participation will involve engaging in a simple assembly task while working in a simulated manufacturing environment in Wood Hall. Sessions will last approximately 25 minutes and I need students to participate in approximately 25 sessions over 3 to 7 weeks. You may schedule up to 2 sessions per day, with a minimum 30-minute break between sessions. Thus, the exact length of your participation will vary from student to student, depending on your schedule and availability. You will be given the option of earning either extra credit (it is offered in this class) or $5.00/hour for your participation in this study.

If you are interested in learning more about participating in this study, please email me at: d.rohn@att.net, or call me at 267-0042. Please remember that you must be available for the study around the middle of this semester. Thanks for your time."

Appendix B

Script for Consent Process

SCRIPT FOR CONSENT PROCESS

To be read aloud by either the student investigator or research assistant

"Before you begin participation in this study you must carefully read a consent form. I will read over the consent form with you. If you have any questions concerning the information we go over, please feel free to ask them. After you have read the consent form, you may either sign it or choose not to participate by not signing. If you choose not to sign, you will not be penalized.

[Hand the participant a consent form and read it aloud to them]

"Do you have any questions regarding the consent form? Please sign on copy of the consent form for my records, and keep the other copy for your records."

Appendix C

Consent Form

WESTERN MICHIGAN UNIVERSITY

DEPARTMENT OF PSYCHOLOGY

Evaluating Performance in a Manufacturing Setting

Don Rohn and John Austin
WESTERN MICHIGAN UNIVERSITY

Purpose. You are invited to participate in a research study that will evaluate performance in a manufacturing setting. The intent of this study is to determine the function of certain managerial practices on performance.

Duration. You are asked to participate in approximately 25 25-minute experimental sessions over 3 to 7 weeks. The length of your participation in the study will vary depending on your availability. You may schedule sessions as often as 2 times a day, with a minimum of 2 hours between the sessions. Sessions can be scheduled any day from Monday through Sunday. No sessions in the study will exceed 30 minutes.

Explanation of Study Procedures. You will be asked to engage in an assembly task that will simulate the type of work a person might perform in a manufacturing setting. You will perform the task in a simulated manufacturing environment in the Performance Management laboratory located in Wood Hall. The task will involve putting together a nut, washer, and bolt arrangement while at a workstation.

Compensation. You may choose between either (1) extra credit points or (2) $5.00 per hour of participation in this study. Your extra credit points or money earned will not be penalized or forfeited should you choose to withdraw from the study. We would also like to remind you that there are other options for extra-credit available in your course, and that participation in this study does not prevent you from taking advantage of those options.

Benefits. You will not receive any direct benefits for participation in this study, however you might be able to perform some tasks related manufacturing work more effectively. Data gained from your participation in the study may benefit the general scientific community by providing information on the function and effectiveness of managerial practices.

Risks and Protections. The nature of the task is one that requires little physical exertion, and should not expose you to risks greater than those presented by your everyday activities. During sessions you may experience minor fatigue. To lessen fatigue you are allowed and encouraged to take breaks if you feel tired or experience any physical discomfort.

As in all research, there may be unforeseen risks to the participant. If an accidental injury occurs, appropriate emergency procedures will be taken; however, no compensation or additional treatment will be made available to you except otherwise stated in this consent form.

Confidentiality. All of the information collected from you and about your performance is confidential. That means that your name will not appear in any publications or presentations of the data collected. Both group and individual data will appear in publications and presentations of this research. However, each student will be assigned a code number when his or her data are entered into an electronic database for analysis purposes.

Any presentations or publications will use code numbers to label individual data. Any forms with identifying information will be retained by Don Rohn over the course of the study and entered into the database using code numbers. Don Rohn will keep a separate master list with the names of participants and the corresponding code numbers. Once the data are collected and analyzed, the master list will be destroyed. Data gathered from the study will be kept in a locked cabinet in the primary investigator's office for at least three years.

Don Rohn and Dr. John Austin are prepared to meet personally with any student who wishes to discuss any aspect of this research project and answer questions about the way data may be or are

presented. As mentioned above, any information that could identify individuals will be removed from data used in any publications or presentations.

Voluntary participation. Your participation in this study is completely voluntary. You are free to withdraw at any time without penalty, and you will receive extra credit or cash payment for the amount of time you participated. Your participation in this study, or your withdrawal from it will not affect your grades in any courses. At the end of the study, the experimenter will answer any questions you have and explain how your data helped us learn more about performance in a manufacturing setting.

Who to contact with questions. If you have any questions about this study you may call Don Rohn at 267.0042. In addition, Dr. John Austin, my faculty advisor can be reached at 387-4495. You may also contact the Chair, Human Subjects Institutional Review Board at 387-8293 or the vice President for Research, 387-8298 if questions or problems arise during the course of the study.

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

Participant Signature	Date

Please keep the attached copy of this form for your records

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Subjects should not sign this document if the corner does not show a stamped date and signature.

Appendix D

Human Subjects Institutional Review Board (HSIRB) Approval Letter

Centennial
1903-2003 Celebration

Date: April 17, 2003

To: John Austin, Principal Investigator
Don Rohn, Student Investigator for dissertation

From: Mary Lagerwey, Chair Mary Lagerwey

Re: HSIRB Project Number 03-04-02

This letter will serve as confirmation that your research project entitled "Exploring the Functional Properties of Work Monitoring" has been **approved** under the **full** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

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

Approval Termination: April 16, 2004

Walwood Hall, Kalamazoo, MI 49008-5456
PHONE (269) 387-8293 FAX (269) 387-8276

Appendix E

Transcript of Recorded Voice Prompt

TRANSCRIPT OF AUDIO VOICE PROMPT

[5 Seconds dead air]

"Please place your work products in bin number 1."

[4'55" dead air]

"Please place your work products in bin number 2."

[10" dead air]

"Please make sure you are putting your work products in bin number 2."

[4'50" dead air]

"Please place your work products in bin number 3."

[10" dead air]

"Please make sure you are putting your work products in bin number 3."

[4'50" dead air]

"Please place your work products in bin number 4."

[10" dead air]

"Please make sure you are putting your work products in bin number 4."

[40" dead air]

Appendix F

Safety Information Handout

Manufacturing Safety Guidelines

Please review this safety handout for ***5 minutes***. When you have finished, please sign the handout on the line at the bottom of the page to verify you have read the handout.

While Working

- ***Shoulders***—Should be aligned with the back; not "slouched" forward *or* shrugged
- ***Back Upright***—Angle between the back and the thigh between 90° and 100° while working
- ***Arms***—Inside angle of elbow between 90° and 100°
- ***Legs***—Angle of inside of knee and ankle between 90° and 100° degrees while working

_____

Signature

Appendix G

Data Collection Sheet

DATA COLLECTION SHEET **PARTICIPANT:** _____ **SESSION:** _____ **DATE:** _____

DEPENDENT VARIABLE	+ = SAFE — = UNSAFE N = NONOCCURRENCE															% SAFE
Shoulders Aligned with Back Shoulders aligned with back; not slouched forward or "shrugged"	1 + − N	2 + − N	3 + − N	4 + − N	5 + − N	6 + − N	7 + − N	8 + − N	9 + − N	10 + − N	11 + − N	12 + − N	13 + − N	14 + − N	15 + − N	
	16 + − N	17 + − N	18 + − N	19 + − N	20 + − N	21 + − N	22 + − N	23 + − N	24 + − N	25 + − N	26 + − N	27 + − N	28 + − N	29 + − N	30 + − N	
	31 + − N	32 + − N	33 + − N	34 + − N	35 + − N	36 + − N	37 + − N	38 + − N	39 + − N	40 + − N	41 + − N	42 + − N	43 + − N	44 + − N	45 + − N	
	46 + − N	47 + − N	48 + − N	49 + − N	50 + − N	51 + − N	52 + − N	53 + − N	54 + − N	55 + − N	56 + − N	57 + − N	58 + − N	59 + − N	60 + − N	
Back Upright Angle of back and thigh between 90° and 100° while seated at workstation	1 + − N	2 + − N	3 + − N	4 + − N	5 + − N	6 + − N	7 + − N	8 + − N	9 + − N	10 + − N	11 + − N	12 + − N	13 + − N	14 + − N	15 + − N	
	16 + − N	17 + − N	18 + − N	19 + − N	20 + − N	21 + − N	22 + − N	23 + − N	24 + − N	25 + − N	26 + − N	27 + − N	28 + − N	29 + − N	30 + − N	
	31 + − N	32 + − N	33 + − N	34 + − N	35 + − N	36 + − N	37 + − N	38 + − N	39 + − N	40 + − N	41 + − N	42 + − N	43 + − N	44 + − N	45 + − N	
	46 + − N	47 + − N	48 + − N	49 + − N	50 + − N	51 + − N	52 + − N	53 + − N	54 + − N	55 + − N	56 + − N	57 + − N	58 + − N	59 + − N	60 + − N	
Arms Inside angle of elbow between 90 and 100 degrees	1 + − N	2 + − N	3 + − N	4 + − N	5 + − N	6 + − N	7 + − N	8 + − N	9 + − N	10 + − N	11 + − N	12 + − N	13 + − N	14 + − N	15 + − N	
	16 + − N	17 + − N	18 + − N	19 + − N	20 + − N	21 + − N	22 + − N	23 + − N	24 + − N	25 + − N	26 + − N	27 + − N	28 + − N	29 + − N	30 + − N	
	31 + − N	32 + − N	33 + − N	34 + − N	35 + − N	36 + − N	37 + − N	38 + − N	39 + − N	40 + − N	41 + − N	42 + − N	43 + − N	44 + − N	45 + − N	
	46 + − N	47 + − N	48 + − N	49 + − N	50 + − N	51 + − N	52 + − N	53 + − N	54 + − N	55 + − N	56 + − N	57 + − N	58 + − N	59 + − N	60 + − N	
Legs Angle inside of knee and ankle between 90-100 degrees	1 + − N	2 + − N	3 + − N	4 + − N	5 + − N	6 + − N	7 + − N	8 + − N	9 + − N	10 + − N	11 + − N	12 + − N	13 + − N	14 + − N	15 + − N	
	16 + − N	17 + − N	18 + − N	19 + − N	20 + − N	21 + − N	22 + − N	23 + − N	24 + − N	25 + − N	26 + − N	27 + − N	28 + − N	29 + − N	30 + − N	
	31 + − N	32 + − N	33 + − N	34 + − N	35 + − N	36 + − N	37 + − N	38 + − N	39 + − N	40 + − N	41 + − N	42 + − N	43 + − N	44 + − N	45 + − N	
	46 + − N	47 + − N	48 + − N	49 + − N	50 + − N	51 + − N	52 + − N	53 + − N	54 + − N	55 + − N	56 + − N	57 + − N	58 + − N	59 + − N	60 + − N	

SAFE INTERVAL % CONVERSIONS	
0/15 = 0%	8/15 = 53%
1/15 = 7%	9/15 = 60%
2/15 = 13%	10/15 = 67%
3/15 = 20%	11/15 = 67%
4/15 = 27%	12/15 = 73%
5/15 = 33%	13/15 = 87%
6/15 = 40%	14/15 = 93%
7/15 = 47%	15/15 = 100%

OBSERVATION TERMINATED?
YES **NO**

Work Products Completed	Bin 1	Bin 2	Bin 3	Bin 4

Appendix H

Workstation Adjustment Log

WORKSTATION SETTINGS

Participant	Chair Height (Inches)	Foot Rest (Y/N)
1-A		
2-A		
3-B		
4-B		
5-C		
6-C		
7-D		
8-D		
9-E		
10-E		

Appendix I

Work Session Script for Information Phase

WORK SESSION SCRIPT

To be read aloud by either the SI or RA Prior to Each Work Session

"Your task for each session will be to assemble widgets. A sample of what your completed product should look like is on the table.

On top of the table there are four numbered bins to place your finished products. In the beginning of the work session, place your finished products in Bin #1. A tape-recorded voice prompt will tell you which bin to place your products in.

Please work at your own pace for the next 20 minutes. I will knock on the door when the session is over."

[DON'T FORGET TO START THE TAPE!!!]

Appendix J

Script for Observation Sessions During Information and Observer Presence Phase

OBSERVATION SCRIPT [OBSERVATION]

[To be read aloud by either the SI or RA Prior to Each Work Session]

"Hello. For the next 10 minutes, I am going to monitor your work performance. In order to minimize distraction from your work task, I am not allowed to talk with you. If you have any questions, please ask them at the end of the experimental session."

[Read this following the observation]

"Please continue working until the end of the session."

[LEAVE THE OBSERVATION ROOM]

Appendix K

Script for Observation Session During Contingent Termination Phase

OBSERVATION SCRIPTS [TERMINATION]
TO BE READ BY SI OR RA

"For the next 5 minutes, I'm going to monitor your SAFE / PRODUCTION performance.

- Your safety goal is to perform each safety target safely _____ out of 15 times.
- Your production goal for this observation period is _____ widgets.

If you meet the goal, the observation period will last only 5 minutes. If you do not, the observation will be the full 10 minutes."

DEPENDENT VARIABLE	+ = SAFE — = UNSAFE N = NONOCCURRENCE														
Shoulders Aligned with Back Shoulders aligned with back; not slouched forward or "shrugged"	0:20 + – N	0:40 + – N	1:00 + – N	1:20 + – N	1:40 + – N	2:00 + – N	2:20 + – N	2:40 + – N	3:00 + – N	3:20 + – N	3:40 + – N	4:00 + – N	4:20 + – N	4:40 + – N	5:00 + – N
	GOAL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15				**# SAFE INTERVALS** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15										
Back Upright Angle of back and thigh between 90° and 100° while seated at workstation	0:20 + – N	0:40 + – N	1:00 + – N	1:20 + – N	1:40 + – N	2:00 + – N	2:20 + – N	2:40 + – N	3:00 + – N	3:20 + – N	3:40 + – N	4:00 + – N	4:20 + – N	4:40 + – N	5:00 + – N
	GOAL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15				**# SAFE INTERVALS** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15										
Arms Inside angle of elbow between 90 and 100 degrees	0:20 + – N	0:40 + – N	1:00 + – N	1:20 + – N	1:40 + – N	2:00 + – N	2:20 + – N	2:40 + – N	3:00 + – N	3:20 + – N	3:40 + – N	4:00 + – N	4:20 + – N	4:40 + – N	5:00 + – N
	GOAL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15				**# SAFE INTERVALS** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15										
Legs Angle inside of knee and ankle between 90-100 degrees	0:20 + – N	0:40 + – N	1:00 + – N	1:20 + – N	1:40 + – N	2:00 + – N	2:20 + – N	2:40 + – N	3:00 + – N	3:20 + – N	3:40 + – N	4:00 + – N	4:20 + – N	4:40 + – N	5:00 + – N
	GOAL 1 2 [ ] 6 7 8 9 10 11 12 13 14 15				**# SAFE INTERVALS** 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15				**PRODUCTION GOAL** **ACTUAL**				**OBS TERMINATED?** **YES / NO**		

IF PARTICIPANT *MEETS* GOAL, SAY THIS...

- "You met the goal, the observation will be ended now. Please continue to work until the end of the session."

IF PARTICIPANT DOES *NOT* MEET GOAL, SAY THIS...

- "You did not meet the goal. The observation will continue for 5 more minutes."

Appendix L

Script for Use During Choice Phase

WORK SESSION SCRIPT [CHOICE]

To be read aloud by either the SI or RA Prior to Each Work Session

"Before we start this session, you can choose to have the observer come to monitor your performance, or you can choose not to have an observer monitor your performance. Your choice will not impact the study in any way, so please choose what you really prefer. Which option would you prefer?"

Give the form to the participant and let him or her check one box below:

Check the box that reflects your preference:

- ☐ I would like an observer to monitor my performance during today's work session
- ☐ I would not like an observer to monitor my performance during today's work session

If the participant chooses to be observed read this:

"During your work session, an observer will come into the work room and monitor your performance for a period of 10 minutes. The observer will enter the room after the first 5 minutes of the work session, and will leave 5 minutes before the session ends. In order to minimize distraction from your work, the observer will not be allowed to interact with you during the observation."

If the participant chooses <u>NOT</u> to be observed, read this:
"You will work alone during the entirety of the work session. Please work at your own pace, and take small breaks if you feel fatigue or any other discomfort."

Appendix M

Participant Exit Interview

EXIT INTERVIEW

To be read by either the SI or RA:

1. What do you think the study was about?
2. What do you think was being measured or observed?
3. What did you think about when the observer announced his or her presence?
4. What did you think about when you were being observed?
5. Did you like being observed?
6. What did you think about when the observer left the room?
7. Did you try to work harder or perform more safely when you knew you could end the observation early?
8. (If answer to #7 was "yes") Why do you think you performed more safely when the observer was present?
9. Do you think your performance improved when the observer was present?
10. Do you think your performance improvement maintained when the observer was absent?
11. Did you say anything to yourself when you were informed you could terminate observation early?
12. What did you think about after you terminated the observation period early?
13. What did you think about when you failed to terminate the observation period early?
14. Would you say your change in performance was due to the goal or because of the opportunity to end the observation session early?
15. Why did you continue to perform above goal-levels even though you knew it wouldn't end the observation session early?
16. How you describe your previous experiences with someone observing you while you work?
17. Did you notice anything unusual about the observation room?

Appendix N

Participant Debriefing Script

PARTICIPANT DEBRIEFING SCRIPT

This script is to be read aloud to all participants following completion of the study by either the student investigator or research assistant.

"This is a brief explanation of the purpose of the study. Please feel free to ask any questions you may have after the explanation.

The purpose of this study was to determine the behavioral function of work monitoring. Several studies have demonstrated that work performance changes when an observer is present to monitor their work. What had not been investigated, until the current study, was *why* performance changes when an observer is present.

Previous research has suggested that people perform differently when an observer is present because the presence of an observer has been associated with unpleasant consequences in the past. However, there is also the possibility that people perform differently in the presence of an observer because observer presence was associated with pleasant consequences. One way to determine whether the presence of an observer has unpleasant stimulus qualities is to make the opportunity to terminate the observation available. This was the purpose of the performance goals presented during the study. If a participant works to avoid or terminate the observation, an unpleasant stimulus function of work monitoring is suggested. If a participant does not work to terminate the presence of an observer, an unpleasant stimulus function of observer presence is not supported.

The practical significance of this question is that if people generally find work monitoring unpleasant, we can work to arrange conditions to change the function of observer presence to be less aversive, and thus improve work-monitoring practices. If people generally find observer presence to be pleasant, then we can look for ways to leverage that advantage towards more effective management practices.

Because performance in the presence of an observer is likely to be different that performance in the absence of an observer, we needed to monitor your performance unobtrusively in order to get a "true" sample of your work behavior. This was done to examine the differences in your performance when the presence of an observer was manipulated. The presence of the hidden camera also allowed us to set attainable performance goals based on your safe performance during the time that an observer was not present, as research has demonstrated that people tend to perform at higher levels when they know they are being observed. In order to do this, we needed to monitor your performance covertly when the observer was not present using a hidden camera. Only research assistants have viewed your performance on tape.

We assure you that the videotapes and all identifying student information will be held in the strictest confidence. Dates and times on videos will be obscured or erased so that individuals cannot be identified by this information. Don Rohn will maintain the security of all data collection forms and videos gathered over the course of data collection by storing them in a locked cabinet inside a locked office (2532 Wood Hall) for at least three years. Only Don Rohn will have access to the locked cabinet, but 9 graduate student members of the PI's research laboratory have access to the office space.

You are free to view the videotapes of your performance, and we invite you to do so. We also invite you to examine your own performance data gathered from the video observation process. If you chose to do so, you may make arrangements with Don Rohn following this

explanation and after asking any questions you may have about the study. We are required to ask for your consent to use the data from the videotapes. If you do not consent to the use of these data, you will not be penalized in any way, and we will destroy your videotapes or give them to you so that you may dispose of them in any way you deem appropriate.

[Hand the participant the consent form]

Do you have any questions?

[Answer any questions the participant has]

Thank you for participating in this study. Your help is greatly appreciated."

Appendix O

Safety and Productivity Performance for
Participants 1 through 10

Table 1

Participant 1 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	100% SD = 0% R: N/A	99% SD = 2% R: 93 – 100	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Back	100% SD = 0% R: N/A	98% SD = 3 R: 93 – 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Arms*	21% SD = 24% R: 0 – 87%	15% SD = 15% R: 0 – 33%	0% SD = 0% R: N/A	13% SD = 13% R: 0 – 47%	63% SD = 16% R: 47 – 93%	6% SD = 6% R: 0 – 20%	18% SD = 19% R: 0 – 40%	5% SD = 10% R: 0 – 30%	N/A
Legs	99% SD = 3% R: 87 – 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	89% SD = 31% R: 0 – 100	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	76% SD = 39% R: 0 – 100%	N/A
Productivity	17 SD = 3.5 R: 12 – 23	21 SD = 3.2 R: 17 – 25	22 SD = 1.4 R: 20 – 24	22 SD = 1.7 R: 19 – 25	22 SD = 1.3 R: 20 – 23	25 SD = 2.7 R: 21 – 29	25 SD = 1.5 R: 22 – 26	23 SD = 2.3 R: 19 – 27	N/A

Table 2

Participant 2 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	100% SD = 0% R: N/A	99% SD = 2% R: 93 - 100%	100% SD = 0% R: N/A	94% SD = 17% R: 43 - 100%	92% SD = 17% R: 67 - 100%	98% SD = 4% R: 93 - 100%	82% SD = 28% R: 40 - 100%	96% SD = 7% R: 93 - 100%	N/A
Back	95% SD = 19% R: 0 - 73%	71% SD = 43% R: 0 - 100%	75% SD = 45% R: 0 - 100%	99% SD = 2% R: 93 - 100%	100% SD = 0% R: N/A	98% SD = 4% R: 93 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Arms*	10% SD = 24% R: 0 – 87%	4% SD = 7% R: 0 - 27%	9% SD = 22% R: 0 - 79%	59% SD = 19% R: 27 - 87%	83% SD = 9% R: 73 - 93%	44% SD = 31% R: 20 - 87%	87% SD = 9% R: 73 - 93%	63% SD = 36% R: 7 - 100%	N/A
Legs	50% SD = 51% R: 0 - 100%	99% SD = 2% R: 93 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Productivity	22 SD = 2.2 R: 18 - 26	25 SD = 3.6 R: 21 – 31	25 SD = 3.4 R: 16 – 32	24 SD = 7.5 R: 4 - 32	25 SD = 1.6 R: 23 - 27	28 SD = 2.4 R: 26 - 31	27 SD = 1.7 R: 24 – 28	28 SD = 1.6 R: 26 – 30	N/A

Table 3

Participant 3 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	96% SD = 8% R: 73 - 100%	N/A
Back	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	82% SD = 32% R: 0 - 100%	100% SD = 0% R: N/A	98% SD = 4% R: 87 - 100%	100% SD = 0% R: N/A	63% SD = 47% R: 0 - 100%	N/A
Arms*	0% SD = 2% R: 0 – 7%	0% SD = 0% R: N/A	0% SD = 0% R: N/A	14% SD = 24% R: 0 - 80%	95% SD = 9% R: 80 - 100%	4% SD = 4% R: 0 - 7%	99% SD = 3% R: 93 - 100%	0% SD = 0% R: N/A	N/A
Legs	91% SD = 29% R: 0 - 100%	90% SD = 17% R: 67 - 100%	99% SD = 2% R: 93 - 100%	51% SD = 36% R: 33 - 100%	99% SD = 3% R: 93 - 100%	58% SD = 36% R: 33 - 100%	100% SD = 0% R: N/A	21% SD = 33% R: 0 - 100%	N/A
Productivity	23 SD = 3.1 R: 16 - 28	29 SD = 1.8 R: 26 – 32	28 SD = 1.5 R: 25 – 30	24 SD = 2.3 R: 21 - 28	25 SD = 1.9 R: 23 - 28	27 SD = 0.8 R: 26 - 28	26 SD = 1.3 R: 25 – 28	30 SD = 1.5 R: 28 – 33	N/A

Table 4

Participant 4 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	99% SD = 3% R: 93 - 100%	98% SD = 4% R: 87 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	98% SD = 3% R: 93 - 100%	N/A
Back	99% SD = 3% R: 93 - 100%	98% SD = 4% R: 87 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	94% SD = 7% R: 80 - 100%	N/A
Arms*	3% SD = 5% R: 0 – 13%	2% SD = 4% R: 0 – 13	0% SD = 0% R: N/A	63% SD = 40% R: 0 - 100%	95% SD = 10% R: 80 - 100%	63% SD = 34% R: 13 - 87%	95% SD = 10% R: 80 - 100%	0% SD = 0% R: N/A	N/A
Legs	33% SD = 47% R: 0 - 100%	58% SD = 44% R: 0 - 100%	100% SD = 0% R: N/A	80% SD = 36% R: 0 - 100%	100% SD = 0% R: N/A	20% SD = 24% R: 0 - 47%	50% SD = 58% R: 0 - 100%	11% SD = 21% R: 0 - 60%	N/A
Productivity	20 SD = 2.3 R: 15 - 22	22 SD = 1.4 R: 20 – 24	22 SD = 1.9 R: 19 – 25	25 SD = 1.5 R: 21 - 26	24 SD = 0.8 R: 23 - 25	25 SD = 0.8 R: 24 - 26	25 SD = 1.0 R: 24 – 26	26 SD = 1.0 R: 25 – 28	N/A

Table 5

Participant 5 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	20% SD = 31% R: 0 - 100%	37% SD = 47% R: 0 - 100%	33% SD = 49% R: 0 - 100%	91% SD = 21% R: 27 - 100%	95% SD = 10% R:80 - 100%	72% SD = 44% R: 7 - 100%	50% SD = 58% R: 0 - 100%	0% SD = 0% R: N/A	0% SD = 0% R: N/A
Back	17% SD = 27% R: 0 - 100%	37% SD = 46% R: 0 - 100%	35% SD = 48% R: 0 - 100%	80% SD = 26% R: 20 - 100%	88% SD = 14% R: 73 - 100%	61% SD = 42% R: 0 - 93%	50% SD = 58% R: 0 - 100%	0% SD = 0% R: N/A	0% SD = 0% R: N/A
Arms*	28% SD = 36% R: 0 – 100%	1% SD = 2% R: 0 – 7%	1% SD = 3% R: 0 – 7%	79% SD = 25% R: 35 - 100%	95% SD = 6% R: 87 - 100%	85% SD = 26% R: 47 - 100%	92% SD = 6% R: 87 - 100%	86% SD = 15% R: 60 - 100%	87% SD = 9% R: 60 - 93%
Legs	84% SD = 35% R: 0 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	90% SD = 20% R: 60 - 100%	100% SD = 0% R: N/A	60% SD = 52% R: 0 - 100%	100% SD = 0% R: N/A
Productivity	20 SD = 2.1 R: 16 - 24	25 SD = 1.3 R: 23 – 27	26 SD = 1.9 R: 23 – 30	25 SD = 2.3 R: 24 - 27	25 SD = 1.0 R: 24 - 26	26 SD = 2.5 R: 22 - 27	27 SD = 1.5 R: 25 – 28	28 SD = 1.2 R: 26 – 30	29 SD = 0 R: N/A

Table 6

Participant 6 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	99% SD = 2% R: 93 - 100%	99% SD = 2% R: 93 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Back	81% SD = 30% R: 0 – 100%	98% SD = 4% R: 87 - 100%	87% SD = 32% R: 0 - 100%	91% SD = 17% R: 47 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Arms*	17% SD = 27% R: 0 – 100%	4% SD = 13 R: 0 – 40%	1% SD = 2% R: 0 – 7%	51% SD = 24% R: 7 - 93%	80% SD = 12% R: 67 - 92%	78% SD = 17% R: 53 - 100%	97% SD = 7% R: 80 - 100%	28% SD = 17% R: 0 - 53%	N/A
Legs	78% SD = 38% R: 0 - 100%	93% SD = 21% R: 33 - 100%	96% SD = 13% R: 60 - 100%	63% SD = 45% R: 0 - 100%	75% SD = 50% R: 0 - 100%	90% SD = 28% R: 20 - 100%	100% SD = 0% R: N/A	10% SD = 16% R: 0 - 40%	N/A
Productivity	24 SD = 3.2 R: 18 - 28	27 SD = 1.8 R: 24 – 29	27 SD = 1.9 R: 24 – 30	28 SD = 2.5 R: 24 - 30	28 SD = 1.4 R: 26 - 29	30 SD = 1.1 R: 29 - 32	29 SD = 1.5 R: 28 – 31	30 SD = 2.1 R: 29 – 32	N/A

Table 7

Participant 7 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	94% SD = 21% R: 7 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	99% SD = 3% R: 93 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Back	89% SD = 27% R: 93 - 100%	99% SD = 3% R: 93-100%	100% SD = 0% R: N/A	98% SD = 4% R: 93 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Arms	48% SD = 37% R: 0 – 100%	60% SD = 25% R: 20 – 92%	93% SD = 10% R: 73 – 100%	68% SD = 32% R: 20 - 100%	75% SD = 42% R: 13 - 100%	69% SD = 47% R: 0 - 100%	60% SD = 55% R: 0 - 100%	0% SD = 0% R: N/A	N/A
Legs	74% SD = 40% R: 0 - 100%	98% SD = 5% R: 87 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	90% SD = 25% R: 33 - 100%	100% SD = 0% R: N/A	63% SD = 46% R: 0 - 100%	N/A
Productivity*	26 SD = 2.2 R: 21 - 31	27 SD = 1.4 R: 25 – 28	29 SD = 1.1 R: 27 – 30	31 SD = 2.0 R: 29 - 34	36 SD = 1.6 R: 34 - 38	31 SD = 2.0 R: 28 - 32	35 SD = 1.5 R: 33 – 37	33 SD = 1.6 R: 31 – 35	N/A

Table 8

Participant 8 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	98% SD = 6% R: 67 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Back	98% SD = 7% R: 67 - 100%	96% SD = 12% R: 67-100%	100% SD = 0% R: N/A	97% SD = 12 R: 60 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Arms	19% SD = 26% R: 0 - 87	61% SD = 30% R: 27 - 100%	85% SD = 16% R: 60 - 100%	58% SD = 30% R: 0 - 100%	87% SD = 14% R: 67 - 100%	24% SD = 23% R: 7 - 40%	94% SD = 9% R: 87 - 100%	89% SD = 9% R: 73 - 100%	N/A
Legs	93% SD = 16% R: 27 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	99% SD = 2% R: 93 - 100	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A
Productivity*	20 SD = 2.1 R: 16 - 24	21 SD = 1.1 R: 20 - 23	23 SD = 0.9 R: 22 – 24	25 SD = 1.3 R: 22 - 26	28 SD = 1.3 R: 27 - 30	27 SD = 1.4 R: 26 - 28	28 SD = 0 R: N/A	25 SD = 1.8 R: 23 - 27	N/A

Table 9

Participant 9 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	42% SD = 41% R: 0 - 100%	22% SD = 35% R: 0 - 73%	29% SD = 29% R: 0 - 73%	30% SD = 36% R: 0 - 100%	28% SD = 41% R: 0 - 93%	N/A	N/A	12% SD = 13% R: 0 - 33%	N/A
Back	18% SD = 34% R: 0 - 100%	18% SD = 40% R: 0 - 100%	23% SD = 40% R: 0 - 100%	13% SD = 25 R: 0 - 67%	17% SD = 41% R: 0-100%	N/A	N/A	0% SD = 0% R: N/A	N/A
Arms	42% SD = 41% R: 0 - 100%	22% SD = 35% R: 0 - 73%	29% SD = 29% R: 0 - 73%	30% SD = 36% R: 0 - 100%	28% SD = 41% R: 0 - 93%	N/A	N/A	12% SD = 13% R: 0 - 33%	N/A
Legs	57% SD = 43% R: 0 - 100%	21% SD = 39% R: 0-100%	68% SD = 41% R: 0-100%	38% SD = 49 R: 0 - 100%	33% SD = 52% R: 0-100%	N/A	N/A	38% SD = 49% R: 0-100%	N/A
Productivity*	18 SD = 2.3 R: 14 - 22	20 SD = 1.2 R: 19 - 22	20 SD = 1.3 R: 18 – 22	22 SD = 1.3 R: 20 - 24	22 SD = 1.9 R: 20 - 26	N/A	N/A	25 SD = 1.8 R: 23 - 27	N/A

Table 10

Participant 10 Safety and Productivity Performance

	Experimental Phase								
	Information	Info + Observation		Info + Obs + Termination		No Termination		Choice	
	Observer Absent	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present	Observer Absent	Observer Present
Shoulders	100% SD = 1% R: 93 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A	N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A
Back	78% SD = 38% R: 0 - 100%	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A	N/A	N/A	100% SD = 0% R: N/A	100% SD = 0% R: N/A
Arms	61% SD = 44% R: 0 - 100%	41% SD = 47% R: 0 - 100%	38% SD = 49% R: 0 - 100%	27% SD = 43% R: 0 - 100%	0% SD = 0% R: N/A	N/A	N/A	42% SD = 45% R: 0 - 100%	0% SD = 0% R: N/A
Legs	48% SD = 48% R: 0 - 100%	22% SD = 35% R: 0 - 83%	33% SD = 52% R: 0 - 100%	11% SD = 29 R: 0 - 100%	0% SD = 0% R: N/A	N/A	N/A	14% SD = 34% R: 0-100%	0% SD = 0% R: N/A
Productivity*	16 SD = 2.5 R: 10 - 20	19 SD = 0.8 R: 18 - 20	22 SD = 0.5 R: 21 – 22	21 SD = 1.8 R: 19 - 24	25 SD = 1.0 R: 24 - 26	N/A	N/A	22 SD = 1.3 R: 19 - 24	24 SD = 0.7 R: 23 - 24N/A

BIBLIOGRAPHY

Austin, J., Carr, J. E., & Agnew, J. L. (1999). The need for assessment of maintaining variables in OBM. *Journal of Organizational Behavior Management 19*(2), 59-87.

Baron, R. S., Moore, D., & Sanders, G. S. (1978). Distraction as a source of drive in social facilitation research. *Journal of Personality and Social Psychology, 36*, 816-824.

Belfiore, P. J., Mace, F. C., & Browder, D. M. (1989). Effects of experimenter surveillance on reactive self-monitoring. *Research in Developmental Disabilities, 10*, 171-182.

Bond, C. F. (1982). Social facilitation: A self-presentational view. *Journal of Personality and Social Psychology, 42*, 1042-1050.

Brewer, N., Wilson, C., Beck, K. (1994). Supervisory behavior and team performance amongst police patrol sergeants. *Journal of Occupational & Organizational Psychology 67*(1), 69-78.

Cacioppo, J. T., Rourke, P. A., Marshall-Goodell, L. G., Tassinary, L. G., & Baron, R. S. (1990). Rudimentary physiological effects of mere observation. *Psychophysiology, 27*, 177-186.

Carver, C. S., & Scheier, M. F. (1981a). *Attention and self-regulation: A control-theory approach to human behavior*. New York: Springer-Verlag.

Carver, C. S., & Scheier, M. F. (1981b). The self-attention induced feedback loop and social facilitation. *Journal of Experimental Social Psychology, 17*, 545-568.

Chapman, A. J. (1973). An electromygraphic study of social facilitation: A test of the "mere presence" hypothesis. *British Journal of Psychology, 65*, 123-128.

Chapman, A. J. (1974). An electromygraphic study of apprehension about evaluation. *Psychological Reports, 1973, 33,* 811-814.

Cottrell, N. B., Wack, D.L., Sekerak, G. J., & Rittle, R. H. (1968). Social facilitation of dominant responses by the presence of an audience and the mere presence of others. *Journal of Personality and Social Psychology, 9*, 245-250.

Daniels, A. (1989). *Performance management.* Tucker, GA: Performance Management Publications.

Droppleman, L. F., & McNair, D. M. (1971). An experimental analog of public speaking. *Journal of Consulting and Clinical Psychology, 36*, 91-96.

Ferris, G. R., Beehr, T. A., & Gilmore, D. C. (1978). Social facilitation: A review and alternate conceptual model. *Academy of Management Review, 3*, 338-347.

Geen, R. G., & Gange, J. J. (1977). Drive theory of social facilitation: Twelve years of theory and research. *Psychological Bulletin, 84*(6), 1267-1288.

Geller, E. S. (1996). *The psychology of safety: How to improve behaviors and attitudes on the job.* Radnor, PA: Chilton Book Company.

Guerin, B. (1986). Mere presence effects in humans: A review. *Journal of Experimental Social Psychology, 22*, 38-77.

Guerin, B. (1993). *Social facilitation.* New York, NY: Cambridge University Press.

Guerin, B. (1994). *Analyzing social behavior: Behavior analysis and the social sciences.* Reno, NV: Context Press.

Hay, L. R., Nelson, R. O., & Hay, W. M. (1977). The use of teachers as behavioral observers. *Journal of Applied Behavior Analysis, 10,* 345-348.

Helander, M. (1995). *A guide to the ergonomics of manufacturing.* Taylor & Francis: Bristol, PA.

Henchy, T., & Glass, D. C. (1968). Evaluation apprehension and the social facilitation of dominant and subordinate responses. *Journal of Personality and Social Psychology, 10,* 446-454.

Kazdin, A. E. (1982). Observer effects: Reactivity of direct observation. *New Directions for Methodology of Social & Behavioral Science, 14,* 5-19.

Komaki, J. L. (1986). Toward effective supervision: An operant analysis and comparison of managers at work. *Journal of Applied Psychology, 71*(2), 270-279.

Komaki, J. L., & Citera, M. (1990). Beyond effective supervision: Identifying key interactions between superior and subordinate. *Leadership Quarterly, 1*(2), 91-105.

Komaki, J. L., Desselles, M. L., & Bowman, E. D. (1989). Definitely not a breeze: Extending an operant model of effective supervision to teams. *Journal of Applied Psychology, 74*(3), 522-529.

Komaki, J. L., & Minnich, M. R. (2002). Crosscurrents at sea: The ebb and flow of leaders in response to the shifting demands of racing sailboats. *Group and Organization Management, 27*(1), 113-141.

Komaki, J. L., Zlotnick, S., & Jensen, M. (1986). Development of an operant-based taxonomy and observation index of supervisory behavior. *Journal of Applied Psychology, 71*(2), 260-269.

Krause, T. R. (1997). *The behavior-based safety process.* New York: Van Nostrand Reinhold.

Larkin, K. T., Ciano-Federoff, L. M., & Hammel, D. (1998). Effects of gender of observer and fear of negative evaluation on cardiovascular reactivity to mental stress in college men. *International Journal of Psychophysiology, 29*, 311-318.

Malott, R. W. (1999). Conceptual behavior analysis. *Journal of Organizational Behavior Management, 19*(3), 75-81.

Malott, R. W., Whaley, D. L., & Malott, M. E. (1997). *Elementary principles of behavior* (3rd ed.) Upper Saddle River, NJ: Prentice Hall.

Martens, R. (1969a). Effect of an audience on learning and performance of a complex motor skill. *Journal of Personality and Social Psychology, 12*, 252-260.

Martens, R. (1969b). Effect on performance of learning a complex motor task in the presence of spectators. *Research Quarterly, 40*, 733-737.

Martens, R. (1969c). Palmar sweating and the presence of an audience. *Journal of Experimental Social Psychology, 5*, 371-374.

McSween, T. M. (1995). *The values-based safety process: Improving your safety culture with a behavioral approach.* New York: Van Nostrand Reinhold.

Mercatoris, M., & Craighead, W. E. (1974). Effects of nonparticipant observation on teacher and pupil classroom behavior. *Journal of Educational Psychology, 66,* 512-519.

Michael, J. (1993). *Concepts and principles of behavior analysis.* Kalamazoo, MI: Society for the Advancement of Behavior Analysis.

Normand, M., Bucklin, B., & Austin, J. (1999). The discussion of behavioral principles in JOBM. *Journal of Organizational Behavior Management, 19*(3), 45-56.

Olson, R. & Austin, J. (2001). Behavior based safety and working alone: The effects of a self-monitoring package on the safe performance of bus operators. *Journal of Organizational Behavior Management, 21*(3), 5-43.

Olson, R., Laraway, S., & Austin, J. (2001). Unconditioned and conditioned establishing operations in organizational behavior management. *Journal of Organizational Behavior Management, 21*(2), 2001, 7-36.

Rohn, D., & Austin, J. (2003). *The immediate effects of observation.* Manuscript in preparation.

Rosenberg, M. J. (1969). The conditions and consequences of evaluation apprehension. In R. L. Rosenthal & R. Rosnow (Eds.), *Artifact in behavioral science* (pp. 279-349). New York: Academic Press.

Rusch, F. R., Menchetti, B. M., Crouch, M. R., Morgan, T. K., & Agran, M. (1984). Competitive employment: Assessing employee reactivity to naturalistic observation. *Applied Research in Mental Retardation, 5*(3), 339-351.

Singerman, K. J., Borkovec, T. D., & Baron, R. S. (1976). Failure of "misattribution therapy" manipulation with a clinically relevant target behavior. *Behavior Therapy, 7*, 306-313.

Triplett, N. (1898). The dynamogenic factors in pacemaking and competitions. *American Journal of Psychology, 9,* 507-533.

Watson, P. J. & Workman, E. A. (1981). The non-concurrent multiple baseline across-individuals design: An extension of the traditional multiple baseline design. *Journal of Behavior Therapy and Experimental Psychiatry, 12*(3), 257-259.

White, G. D. (1977). The effects of observer presence on activity level of families. *Journal of Applied Behavior Analysis, 10,* 734.

Wilk, L. A., & Redmon, W.K. (1998). The effects of feedback and goal setting on the productivity and satisfaction of university admissions staff. *Journal of Organizational Behavior Management 18*(1), 45-68.

Zajonc, R. B. (1965). Social facilitation. *Science, 149*, 269-274.

Zajonc, R. B. (1980). Compresence. In P. B. Paulus (Ed.), *Psychology of group influence* (pp. 35-60). Hillsdale, NJ: Erlbaum.