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### An Analysis of the Role of Reactivity in the Observer Effect

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An Analysis of the Role of Reactivity in the Observer Effect

by

Allison Hughes King

A dissertation submitted to the School of Behavior Analysis of  
Florida Institute of Technology  
in partial fulfillment of the requirements  
for the degree of

Doctor of Philosophy  
in  
Behavior Analysis

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July, 2017

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## **Abstract**

Title: An Analysis of the Role of Reactivity in the Observer Effect

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Peer observations, which consist of employees observing and scoring their coworkers' performance of some targeted behavior(s), are often an important component of behavioral safety interventions. Research on peer observations has demonstrated that individuals improve their performance of a task as a result of observing and evaluating their coworkers perform that task, a phenomenon known as the observer effect. Most of the research has demonstrated this effect when the observers were aware that their performance of the task was also *being* observed, suggesting that reactivity may play an important role. The current study examined this by evaluating the impact that observing others' safety performance had on the observers' subsequent safety performance under reactivity and non-reactivity conditions. Results suggest that the observer effect might be more robust when observers are aware that their performance is also being evaluated.

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## **List of Keywords**

Observer effect

Reactivity

Safety

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## **Introduction**

The U.S. Bureau of Labor Statistics (BLS) stated that in 2014, nearly 3.0 million nonfatal injuries and illnesses occurred for private industry workers (BLS, 2015). That same year, about 700,000 injury and illness cases were reported among state and local government workers, making the rate relatively unchanged from a year earlier and higher than the rate among private industry workers (BLS, 2015). Additionally, there were 4,821 fatal work injuries in the United States in 2014, which is the highest annual total since 2008 and represents the first increase in the national fatal injury rate since 2010.

These data serve as a reminder that improvement efforts targeting safety need to be a major priority in the U.S workplace. Some of the most common types of workplace injuries include falls to lower levels, slips/trips and falls, overexertion due to lifting/lowering, repetitive motion injuries, machine crushing or entanglement, work-related vehicle accidents, and falling objects or debris (Arnold & Itkin, 2015). These are all included in the top 10 preventable workplace incidents, and recommendations for the prevention of each consist of improving employees' safety-related behaviors or changing aspects of the workplace environment that will facilitate employees' safe performance (National Safety Council, 2013).

The growing use of electronic databases for analyzing safety incidents has also highlighted the importance of focusing on employees' safety-related behaviors

(Inglesby, 2014; Leaman, 2016). Organizations that use these systems have an opportunity to better understand the common types and trends of safety incidents in their workplace; however, safety management decisions based *only* on evaluations of these data do not help organizations proactively address safety issues. Many argue that safety incident data is a “lagging indicator” of workplace safety because trends in the data for a particular period of time are not noticed until sometime *after* the performance occurred (Leaman, 2016). Therefore, these data alone are not sufficient to make performance management decisions that *prevent* safety incidents.

Organizations should therefore focus on behavior since it is a more leading indicator of safety (Mathis, 2009). For example, data on employee behaviors can be compared to data on safety incidents until relations between behaviors and reduced incidents are identified. Data on these behaviors will function as leading indicators in that they will enable organizations to see trends related to safety incidents *before* the incidents happen. Thus, organizations will be better equipped to make safety-related performance management decisions that prevent incidents from occurring. For example, once relations between employee behaviors and safety outcomes are identified, organizations can focus their safety improvement efforts on developing and implementing interventions that improve employee performance of these behaviors.

## **Behavior Based Safety**

One method that has been successful at improving workplace safety through behavior change is Behavior-Based Safety (BBS) (Sulzer-Azaroff & Austin, 2000). BBS is the application of the scientific method to behavior change in the workplace in order to achieve continuous improvement in safety performance (Krause, 1997). BBS helps organizations improve safe workplace performance by pinpointing safety outcomes and behaviors, defining them objectively, developing and implementing measurement methods, and designing and implementing a feedback and positive reinforcement system to improve and maintain safe performance (Sulzer-Azaroff & Austin, 2000).

A popular measurement method used in BBS is peer observations, which involve employees conducting observations of their coworkers' safety performance (Health and Safety Authority, 2013). When peer observations are used, employees typically observe their coworkers' performance of the targeted behavior(s) under different conditions, score their performance on a data sheet, and sometimes deliver performance feedback. The completed data sheets can then be given to a manager or BBS consultant to graph the data, identify trends, and deliver group performance feedback (McSween, 2003).

Peer observations are also useful as a measurement method because they don't require much time from the supervisor and they promote peer-to-peer feedback (Williams, 2005). Feedback has been shown to be a highly successful

intervention for improving employee performance in the workplace (Alvero, Bucklin, & Austin, 2001). Additionally, feedback from peers can be very powerful because employees are usually in contact with their coworkers more often than their supervisor (Aubrey Daniels International, 2014). This allows peers to give more immediate and behavior-specific feedback, which may influence performance more quickly than delayed feedback and feedback that is less specific (Ludwig & Goomas, 2007; Miltenberger, 2012).

Some have also suggested that peer observations might promote the generalization and maintenance of BBS intervention effects. For example, a review by Sigurdsson and Austin (2006) demonstrated the importance of programming for institutionalization when the goal of the intervention is to improve performance *and maintain* improvements. They describe the four variables of institutionalization as internal staff involvement in: 1) intervention development, 2) intervention implementation, 3) data collection, and 4) consequence delivery.

The authors reviewed articles from the *Journal of Organizational Behavior Management* from 1991-2002 to collect data on the number of studies that included institutionalization variables and the study's intervention effectiveness and maintenance. Their regression analysis found a relation between the number of these variables included in a study and the effectiveness of that study's intervention. Their linear regression analyses showed that adding one of the four variables would on average result in effect size increases of 0.52 for comparisons

between a study's baseline and intervention and 0.40 for comparisons between a study's baseline and maintenance. Peer observation procedures require internal employees to participate in the process of collecting data on the targeted behaviors, which is one of the variables needed for institutionalization. Therefore, peer observations may be an important ingredient for successful BBS interventions, given that the maintenance of intervention effects is imperative to the goal of BBS and the mission of its field.

### **The Observer Effect**

In addition to the benefits already mentioned, peer observations have also been found to result in a phenomenon known as the *Observer Effect*. The observer effect occurs when the act of observing and evaluating someone else's performance of a task improves the *observer's* subsequent performance of that task (Alvero & Austin, 2004). The observer effect can occur for employees participating in peer observations in a BBS program because the very behavior that the observers are measuring may be one that *they* are required to perform on the job as well.

The observer effect was first examined by Alvero and Austin (2004) in a simulated office setting. The researchers evaluated the extent to which observing and scoring videos of confederates' safe body positions would impact the observers' subsequent safe body positions while performing office tasks. Participants were exposed to a baseline, information, and observation phase. During the information phase, participants were told that the purpose of the study was to



observe individual safety behaviors in an office setting and were given a handout with the operational definitions for the four targeted postures (back straight and knees bent when lifting, neck and wrist position while typing for Group A; back, shoulder, and feet position when sitting; neck alignment when using the phone for Group B). During the observation phase, participants were asked to observe and score the safe postures of a confederate performing similar office tasks in a 5-min videotape before each session.

Results showed that safety performance remained unchanged for 78% of the opportunities for replication of target-behavior changes (four different behaviors for each of 8 participants) during the information phase. During the observation phase, safety performance improved considerably for 66% of the opportunities for replication of target-behavior changes (eight different behaviors for each of eight participants). Findings also showed that, although participants were observing all eight postures when scoring videos of the confederates, they only improved their performance of the postures that they were asked to score. Based on these findings and results from exit interviews with participants, the authors explained that self-monitoring may have been a causal factor involved in the performance improvements seen during the observation phase. Participants reported that scoring the confederate's postures triggered them to monitor their own postures while they performed office tasks.

Sasson and Austin (2005) found similar observer effects in an applied office setting. The researchers examined the effects of observing and scoring others' safe ergonomic performance on the observers' subsequent safe ergonomic performance. They also examined whether the observers' safe performance was impacted by their accuracy of observations. Eleven computer terminal operators first received brief training on correct ergonomic behavior for the targeted body positions (wrist, neck, back/shoulder, and foot). Half of the participants were then trained to observe and score the ergonomic behavior of one of the non-observer participants. During the observation phase, participant observers observed and scored the ergonomic performance of their assigned non-observer participant with an experimenter at the beginning of each session. During a subsequent feedback condition, all participants were given daily written feedback from an experimenter that described their average percent safe for each posture from their previous morning session.

Correlation coefficients between participants' accuracy of observations and their subsequent ergonomic performance showed no correlation for three participants and medium to high correlations for three participants. Effect size results showed that participants who received training and conducted observations exhibited more than twice the improvements in the targeted body positions than participants who only received training. Additionally, differences across observer and non-observer participants were maintained during the feedback condition.

Although, the authors explained that differences from either conducting

observations and/or receiving feedback seemed to be weakened during conditions in which there may have been reactivity effects (e.g., the Information and Follow-up conditions). For example, participants reported in their exit interviews that they believed the researchers returned because they had not performed well enough in the beginning of the experiment, indicating the occurrence of reactivity to the presence of the experimenters.

To further examine the causes of the observer effect, Taylor and Alvero (2012) investigated the behavioral functions of conducting observations by comparing the effects of discrimination training alone with discrimination training plus observations of others in a simulated office setting. The purpose of this comparison was to examine whether conducting observations would further improve participants' performance even after their discrimination of the targeted behaviors was at or near 100%. This would allow the researchers to see if conducting behavioral observations might serve as more than just a skill acquisition function. The researchers also examined whether the observers' accuracy of observations would impact their subsequent performance of the observed task.

This study included five university students and targeted their performance of four safe postures while typing on a computer. After receiving operational definitions for the four targeted behaviors and correctly demonstrating each, participants were exposed to 3 phases: baseline, training, then training plus observations. Immediately before the first session of the training phase, participants

received discrimination training once per behavior. During the first session of the training plus observation phase, participants received the same discrimination training that they received in the previous phase. Observations during the following sessions consisted of watching videos of confederates typing on a computer and scoring their safe postures at the beginning of each session. Participants were retrained whenever their accuracy of a safety observation was below 90%.

Correlation coefficients between participants' observation accuracy and safety performance demonstrated a correlation for only one of the participants. Results also showed that conducting observations *did* further improve participants' performance of the targeted behaviors, even though their accuracy level was already greater than 90% during the discrimination training. These findings suggested that the observer's improvement of the observed task is caused by something more than just learning how to perform that task. The authors suggested that the observer's improved performance of the task might be evoked by motivation variables associated with the observation and data collection process itself. They explained that the observation procedures used in this and previous observer effect studies might have established conditions that increased participants' attentiveness to the experimenters' focus on safety-related behavior. Therefore, similar to Sasson and Austin (2005), reactivity to the likelihood of *being* observed may have played a role in the participants' improvement of the targeted safety behaviors (Taylor & Alvero, 2012). The researchers speculated that

observation procedures might acquire similar or other kinds of demand characteristics (Orne, 1962).

The observer effect has also been examined in non-office settings and with behaviors other than postures. Nielsen, Sigurdsson, and Austin (2009) investigated the effects of observing and scoring others' performance of one-person patient transfers on the observers' subsequent performance of one-person patient transfers in a nursing unit. Following baseline, 5 of the 6 nurses were exposed to an information phase, which consisted of reviewing and signing a checklist that listed the components for one type of patient lift (wheelchair-to-standing lift for Group A; standing-to-wheelchair lift for Group B) with an experimenter. All 6 were then exposed to a video scoring phase, in which they watched videos of confederates performing lifts and scored them using their checklist at the beginning of each session. An experimenter also delivered feedback to participants about their scoring accuracy. Finally, 2 participants participated in a feedback phase, which consisted of receiving verbal and graphed feedback from an experimenter at the start of each shift about their performance of patient lifts during each of the previous phases.

Results showed that 5 of the 6 participants who conducted observations improved their performance of the targeted patient transfer, and these improvements were greater than those exhibited after receiving information about the safe patient transfers. The 2 participants exposed to feedback after the videos scoring phase showed even further improvements. During a subsequent withdrawal

condition, the participants who received feedback decreased performance to levels displayed during the video scoring phase. Additionally, the other 3 participants who improved their performance during the video scoring phase maintained their improvements during the withdrawal condition.

The researchers suggested that improvements may have occurred because each experimental phase was comprised of progressively intrusive prompts for safe performance. The videos may have served as more effective prompts than information alone because the videos included more detailed instruction and/or because participants received feedback on the accuracy of their evaluations of others' patient lifts. Given the findings from previous observer effect studies, the researchers also suggested that video scoring might have occasioned self-monitoring. Finally, performance for participants exposed to feedback might have increased because it allowed them to discriminate between kinesthetic stimuli associated with safe and at-risk movements, enabling the kinesthetic stimuli to begin controlling their postural behavior.

Guercio and Dixon (2011) evaluated the impact of the observer effect on staff's positive interactions with patients and patients' productive activities and happiness levels in a neurobehavioral residential setting. Participants included fifteen day shift staff; five members in each of the three residences participated. After baseline, participants were exposed to a task clarification phase, in which they were given the operational definitions of the targeted staff and patient behaviors.

Staff positive interactions were measured using a set of operationally defined descriptors represented in the acronym PEARL (P: positive, upbeat, requests, promotes + behavior; E: intervene before problems occur; A: interacts with all residents; R: praises good behavior; L: looks for ways to teach). PEARL behaviors were coded numerically based on the frequency of their occurrence. All staff members received training on positive interaction styles and the use of PEARL during their orientation to their job. Resident productive activity was measured by a scale modeled after the Group Activity Observation Form described by Reid and Parsons (2002) and resident happiness was measured according to behavioral definitions of vocalizations and facial expressions described by Green and Reid (1996).

Participants were then exposed to the observation phase, during which day shift staff watched 5-min videos depicting the behaviors they received definitions for during the task clarification. Participants scored desirable and undesirable examples of staff interaction behaviors (PEARL) by using a checklist. They also scored the resident behavior they observed according to the Group Activity Observation Form.

Results showed that the observation phase improved positive staff interactions, resident productive activities, and resident happiness above and beyond the task clarification phase. The researchers suggested that the observation phase may have produced meaningful improvements in staff performance because

the operational definitions of the different levels of positive interactions became more noticeable to staff once they were required to use them to evaluate others' positive interactions. They proposed that this allowed staff to evaluate positive interactions more objectively, which may have provided them with a better antecedent of their own behaviors.

### **Reactivity to Being Observed**

As discussed earlier, the results from Sasson and Austin (2005) and Taylor and Alvero (2012) suggest that the observers' performance improvements may be influenced by demand characteristics, or reactivity to the awareness that one's own performance might be evaluated. Reactivity, or the influence that an assessment procedure exerts on the subject's performance (Kazdin, 1979) has been a phenomenon of interest and concern in behavioral research since the mid 1900's. According to Ivancic and Helsel (1998) the impact of reactivity on the performance of the person *being* observed continues to be a concern in studies evaluating employee performance (as cited in Brackett, Reid, and Green, 2007).

For example, Brackett et al. (2007) demonstrated reactivity of staff behavior to observations of their work performance in a publishing company. Participants were job coaches who worked individually with supported workers. The researchers targeted completion of four work-break steps by the job coach rather than by the supported worker (either independently or with job-coach prompting). During the baseline phase, each coach was trained to conduct work breaks by



prompting the worker to complete the steps and refraining from completing steps for the worker. During conspicuous observations, a coordinator conducted observations of the job-coaches, recorded their performance on a sheet while in close visual and physical proximity to the job coach, and delivered feedback. During the inconspicuous observation phase, a coordinator conducted unobtrusive observations of job-coaches so that they would not know they were being observed. In a third phase, job-coaches self-recorded their performance while inconspicuous observations were conducted, and no feedback was provided.

Results from this study showed that none of the job coaches completed any work-break steps for their supported workers during conspicuous observations after the training. During the inconspicuous observation phase, both coaches completed most of the steps for the worker. A return to baseline (conspicuous observations) showed that both coaches again completed none of the steps for the worker. Finally, when the coaches were asked to self-record their performance, data from the coordinator's inconspicuous observations showed that the coaches' performance was similar to their performance during the conspicuous observation phases. That is, the job coaches refrained from completing the work-break steps for the supported worker.

These results indicated that the job coaches' performance was likely impacted by reactivity to the conspicuous observations of their behavior, and that self-recording may have impacted their performance in a similar way, even in the

absence of conspicuous observations by others. The authors explained that the immediate change in the participants' performance during the first session of the reversal to conspicuous observations argues against the effects of feedback alone. Instead, the conspicuous observations may have exerted stimulus control over performance because of its previous pairing with feedback. Additionally, during the self-recording phase, stimuli that the self-recording procedures were paired with may have impacted participants' performance. For example, the coordinator's delivery of the self-recording form at the beginning of work breaks and her retrieval of it at the end of the session during the self-recording phase may have impacted performance since she had previously delivered performance feedback during conspicuous observations.

Another study by Rohn (2004) evaluated the behavioral function of observer presence on students' safe postures during an assembly task by systematically manipulating (a) the presence/absence of an observer, and (b) the operation of a performance-contingent observation termination contingency. After being trained in the assembly task, participants were exposed to an information phase, in which an experimenter asked participants to review and sign a sheet containing the operational definitions for each posture. An experimenter also modeled each behavior and delivered feedback to participants after the participant demonstrated each behavior. The subsequent information and observer presence phase was just like the previous, except for that an observer was present to monitor the

participants' performance during their following work sessions. The observer told the participants that he or she would be monitoring their performance for the next 10 minutes, and did not deliver any feedback after observing. Procedures during the following information, observer presence, and performance-contingent termination phase were identical to the previous, except for that participants were given the option to terminate the presence of the observer five minutes early if he or she met a safety or production goal. An information, observer presence, and no performance-contingent termination phase was also added for 8 of the 10 participants to separate the effects of goal setting with termination of the presence of the observer. This phase was identical to the previous, except that participants were told that they could not terminate the observation sessions even if they met their goal. Finally, participants were exposed to a choice phase, which allowed participants to choose between observer-present and observer-absent conditions.

Overall, results indicated that the safety behavior of the participants was not reactive to the mere presence of an observer. Outcomes from the termination and no termination phase demonstrated that participants' performance during the termination phase was impacted by the goal statement, rather than by the opportunity to remove the observer's presence. However, one difference between this study and previous studies demonstrating reactivity (e.g., Rohn and Austin, 2003) was that participants in the current study were *not* told what behaviors the observers would be watching during the observation phase, which may have

lessened the likelihood of reactivity (as cited in Rohn, 2004). The authors explained that these findings suggest four conditions necessary for the occurrence of reactivity: (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 perform the targeted behavior correctly, and (4) the person being observed must be able to tact the behavior being targeted during observation (p. 55).

Mowery, Miltenberger, and Weil (2010) also examined the influence of reactivity on staff performance by examining the impact of a tactile prompt, self-monitoring, and feedback on positive interactions between direct support staff and their clients in the presence and absence of a supervisor. During baseline, participants' positive interactions were observed and recorded unobtrusively by a confederate or the participants' supervisor, and no feedback was provided. Next, participants received training on positive interactions. They were given a MotivAider, which was programmed to vibrate every minute to prompt them to interact with clients in a positive manner. They also received a self-monitoring form and were instructed to place a check mark at each 1-min interval in which they engaged a client in social positive interactions. During the post-training assessment, staff performance was measured in three conditions: 1) supervisor present and MotivAider on, 2) supervisor absent and MotivAider on, 3) supervisor absent and no MotivAider (baseline probe).

Results for two of the four participants were similar to those found in Brackett et al. (2007); their performance was influenced by reactivity to conspicuous observations of their performance. However, results from this study differed from those in Brackett et al. in that the self-monitoring improved performance, but only when the supervisor was present (i.e., during conspicuous observations). Additionally, two of the participants did not increase positive interactions after self-monitoring was implemented, even when the supervisor was present. Although, one difference between this study and Brackett et al. was that participants in this study did not receive feedback from a supervisor prior to the introduction of self-monitoring. Therefore, supervisor feedback was added for the two participants who did not improve their performance to examine whether positive interactions would increase once there was a history of feedback from the supervisor. Once this was implemented, both participants improved their performance significantly, but only one maintained improvements once feedback was removed.

In a more recent study, Fuesy, Miltenberger, Crosland, and Weil (2013) examined the effectiveness of performance feedback and self-monitoring on staff treatment integrity of individualized behavior plans during the presence and absence of an observer. During baseline, both conspicuous and inconspicuous observations were conducted on staff treatment integrity. After baseline, staff received a behavioral skills training (BST) on the implementation of the behavior

plans. Conspicuous and inconspicuous observations occurred as in baseline, and feedback was delivered to participants by the researcher following conspicuous observations. A subsequent performance feedback and self-monitoring phase was introduced. Staff received a BST on how to use the self-monitoring form and were instructed to document their performance of implementing the behavior plan's components every 30 min. Although the staff were asked to use the self-monitoring form, the investigator explained that these forms would not be collected or viewed by the investigator. Conspicuous and inconspicuous observations occurred as they did in the previous phase; performance feedback was only delivered during the conspicuous observations.

Results showed that the initial BST improved performance, but did not sustain improvements in either the conspicuous or inconspicuous observation conditions. Once self-monitoring was introduced with performance feedback, staff treatment integrity improved only during the conspicuous observations, except for one client's behavior plan. These outcomes suggested that reactivity likely impacted the participants' performance. However, these findings also differ from Brackett et al. (2007), who found that performance improved even during inconspicuous observations after self-monitoring was introduced. The authors explained that the self-monitoring procedures might not have increased performance during inconspicuous observations because participants were told that investigators or supervisors would not be retrieving their self-monitoring data.

Overall, these findings show that the presence of an observer can cause reactivity, elevating participants' performance of the observed behaviors. They also demonstrate that reactivity is more likely to occur when the performer has a history of receiving valued consequences, such as performance feedback, after being observed or from the observer. Finally, they suggest that reactivity (and an improvement in the targeted behavior) can occur in the *absence* of an observer when other stimuli are present that have been paired with an observer or the availability of valued consequences contingent on the individual's performance of that behavior. Since previous research evaluating the effects of peer observations has suggested that reactivity may play a role in the observer's subsequent performance improvement, reactivity will now be discussed in the context of peer observations and the observer effect.

### **Reactivity in the Observer Effect**

Although most of the findings from research on the observer effect are encouraging, some studies have found different results between participants within the same study or results that conflict with outcomes from previous studies. If reactivity is a necessary condition for the observer effect to take place, then the absence of variables that cause reactivity might explain why participants in some studies did not demonstrate improvements after conducting observations of others. For example, one participant (participant A4) in the study by Nielsen, Sigurdsson, and Austin (2009) did not exhibit any improvements in her safe patient transfers

after conducting behavioral observations. According to the authors, one factor that might explain this outcome is that she did not experience the information phase prior to conducting observations. The information phase required participants to meet with an experimenter to review and sign a checklist that included operational definitions for each component of the targeted safe patient transfer. Participants were also informed at this time that completing the components in that order would help the participants remain safe and reduce injuries.

Therefore, the procedures used in the information phase may have implied to the participants that their own performance was important to the study or might be observed. Previous studies have suggested that the observer effect might occur because conducting observations might increase participants' attentiveness to the experimenters' focus on the behaviors they are observing. However, this might not have caused a change in behavior for participant A4 in Nielsen et al. (2009) because she began conducting observations without first experiencing the information phase. Therefore, she might not have believed that she was conducting observations to improve her *own* performance of that behavior. Although the participants (including A4) received feedback on their scoring accuracy during the observations, the experimenter did not provide any specific safety feedback or state future beneficial consequences from the correct lifting behaviors (p. 556). Since A4 scored others' performance of these behaviors and received feedback on her scoring



accuracy, it is unlikely that her lack of improvement was caused by not knowing what the targeted behaviors were.

Results from a study by Howard, Burke, and Allen (2013) also showed that some participants did not demonstrate performance improvements after conducting observations. This study examined the extent to which supervisors' treatment integrity would improve after conducting observations on staff treatment integrity in a day treatment center. After baseline, supervisors were exposed to a data collection program, which consisted of: (1) a preintervention meeting with an administrator about the importance of using Behavior Specific Praise (BSP) with clients, (2) a data sheet that listed examples, the operational definition, and staff's goal for delivering BSP, and (3) the actual observations and data collection of staff's performance of BSP. Results showed that 3 supervisors improved their performance of delivering BSP during the data collection program, but 2 supervisors (Cara and Dina) did *not* show improvements in delivering BSP.

In this study, the preintervention meeting that occurred before the participants began conducting observations was similar to information phases in previous studies. However, in this study, the participants were told that the purpose of the meeting was to see if they would be willing to collect data on staff performance of the targeted behavior (p. 499). In previous studies, the information phases simply included an experimenter reviewing the operational definitions of the targeted behaviors with the participants, which may have led participants to believe

that their performance of this behavior was important to the study. Thus, some participants in the current study might not have believed that the administrator and/or the researchers were increasing their focus on *their* (participants) performance of this task since they were told that this information was being reviewed with them to prepare them for conducting observations of *others'* performance.

It is interesting that 3 of the 5 supervisors did improve their performance. Although, the preintervention meeting in the current study also differed from information phases in previous studies in that an *administrator* at the participants' workplace was the one who delivered the information to the participants, rather than a researcher. The authors explained that the supervisors already had knowledge of the importance of treatment integrity (including BSP), and that this behavior was addressed with feedback from the administrator in their work environment as needed (p. 494). This indicates that the supervisors may have had a history of receiving feedback about their performance of this behavior from the administrator.

This might explain why some supervisors *did* improve their performance after conducting observations. As discussed earlier, previous research on reactivity has suggested that reactivity might occur because some stimulus is present that exerts control over performance due to its previous pairing with feedback or other consequences important to the performer (e.g., Brackett, Reid, & Green, 2007). For

example, the two participants in Mowery, Miltenberger, and Weil (2010) did not improve performance after self-monitoring was implemented, even when a supervisor was observing. After implementing a feedback condition to establish a history of feedback from the supervisor, both participants improved their performance significantly in the presence of the supervisor.

It is possible that some participants in Howard et al. (2013) had different histories of receiving feedback from the administrator about their performance of BSP or treatment integrity in general. The authors also reported that one of the participants who did not demonstrate improvements (Dina) was planning to leave her job, which may have made the importance of BSP less significant to her. Additionally, even if Dina anticipated experiencing performance feedback on BSP from the administrator, planning on leaving her job may have weakened the value of the administrator's feedback as a consequence to her performance.

Finally, differences were found across participants in an observer effect study by King, Wilder, and Sigurdsson (2014). This study examined the influence of the observer effect on therapists' use of gloves in an autism treatment center. Following baseline, participants were exposed to an information phase, in which an experimenter met with each participant to ask them if they would help the author collect behavioral data for a study. The experimenter then discussed with the participants the center's glove-use policy and operational definition of correct glove-use, and to tell them that they would be collecting data on other therapists'

performance of this behavior. During the following observation phase, the therapists watched and scored 5-10 min videos of fellow therapists' correct use of gloves at the beginning of each session.

Results showed that only 1 of the 3 participants improved her performance of using gloves correctly after observing and scoring others' performance. Exit interviews suggested that all 3 participants began to think about their own performance of using gloves after conducting observations. However, the participant who demonstrated an improvement added that she also *wanted* to improve her glove-use because she had received corrective feedback from a supervisor about her glove-use in the past. Additionally, the 2 participants who did not demonstrate improvements after conducting observations were exposed to a final feedback phase in which a supervisor delivered performance feedback to them about their performance of using gloves. Results showed that supervisor feedback immediately improved their performance of using gloves. During the exit interviews, these participants added that even though they began to think about their own performance after conducting observations, they did not *change* their behavior because they believed that their performance of this behavior was not important to their role in the study or even their supervisors. These findings lend some additional support to the notion that the observers' subsequent performance improvement may be influenced by reactivity or demand characters, as described in Sasson and Austin (2005) and Taylor and Alvero (2012).

The information phase in this study was also similar to the preintervention meeting in Howard et al. (2013) in that the participants were told that the purpose of receiving information about the targeted behavior was to see if they would collect data on *others'* performance of that behavior for a study. If the participants in the current study were not told during the information phase that they were receiving information about this task to collect data on *others'* performance of this task, they might have believed that *they* were the participants in the study. This may have caused them to change their behavior to please the experimenter once they began to self-monitor their performance. During the exit interview, one of the participants who did not improve her performance also added that she would have improved her glove-use if a particular supervisor (rather than a researcher) had asked her to collect data on this behavior, even if she wasn't explicitly told that her performance would also be observed.

In conclusion, one common factor between the participants who did not demonstrate improvements in Nielson et al (2009), Howard et al. (2013), and King et al. (2014) may be that they were not aware that *their* performance of the observed task was being observed or was important to the researchers and/or supervisors at their job. Alvero, Rost, and Austin (2008) also discussed this as being a factor that might cause different observer effect results across studies.

“Although Sasson and Austin (2005) replicated the effects in an applied setting, the participants were aware when their behavior

was being observed. The safety observer effect occurs when an observer's safety performance increases as a result of conducting a safety observation *and* then they themselves are being observed. In other words, would this observer effect occur if the safety observer, or participant, were unaware that their performance was being monitored? This is an important question that should be addressed in order to strengthen the validity of this effect” (p. 372).

Although some studies *have* evaluated the observer effect without explicitly telling participants that their performance of the targeted behavior was important or would be observed, aspects of either the observation phase or a preceding information phase likely suggested to participants that their performance would be monitored or was important to the researchers or supervisors/administrators at their job. Additionally, no study has compared observer effects for participants who *are* told that their performance of the observed task is being evaluated to participants who are *not* told or led to believe that their performance of the task is being evaluated. Therefore, the question by Alvero et al. (2008) remains unanswered; it is still unclear whether the observer effect will occur for participants who do *not* believe that their performance of the task is being evaluated.

## **Mechanism of the Observer Effect**

If motivation variables do play a role in the observer effect as previous findings have suggested, then it is likely that the observer's awareness about being observed *does* impact the extent to which conducting observations improves his performance. The behavioral account of language and rule-governed behavior might explain how motivation variables play a role in the observer effect, and how they may be stronger for observers who believe that their own performance of the task is important. The behavioral account of language asserts that when we observe our environment, we tact (publicly or privately) what we see because tacting has been reinforced by our verbal community from a very young age (Fryling, Johnston, & Hayes, 2011). It also declares that we start to self-generate rules about our environment when we identify relationships between events we observe. Additionally, the behavioral account of rule-governed behavior suggests that we typically follow the rules we self-generate because rule-following has also been reinforced by our verbal community from a young age (Fryling, Johnston, & Hayes).

Outcomes from previous observer effect studies suggest that participation in the observation and data collection process may cause observers to self-monitor their performance of the task and self-generate rules about their performance and its consequences (Alvero & Austin, 2004; Sasson and Austin, 2005). As discussed earlier, the exit interview results from participants in Sasson and Austin (2005)

revealed that participants began to say the operational definition of correct performance to themselves, tell themselves how to perform safely, and compare their performance to the individuals that they had observed in the videos after conducting observations. Sasson and Austin also reported that the presence of the experimenters during follow-up observations caused the participants to believe that they had not performed well enough in the earlier phases of the study, which may have caused the observers to generate self stated rules that specified avoidance contingencies. Exit interviews from the other observer effect studies also found very similar results (e.g., Alvero & Austin, 2004; Alvero & Austin, 2006; Taylor & Alvero, 2012).

These findings support the idea that the observer's reactivity to the awareness that he or she might *be* observed may play a role in his or her behavior change in the observer effect. It is possible that conducting observations only results in performance improvements when the observer self-monitors his performance *and* generates self-rules that specify reinforcing and/or punishing consequences for improving and/or not improving his performance of the task he is observing. In other words, conducting observations may cause an observer to covertly evaluate his or her own performance of the observed task more often, but this self-monitoring on its own might not actually *change* the observer's performance of the observed task if he or she does not also generate these type of self-rules. One would assume that an observer who does not know that his



performance of the task is also being observed and evaluated might be less likely to self-generate rules that specify consequences for improving and/or not improving his performance, especially socially-mediated consequences, such as the avoidance-contingencies described in Sasson and Austin's exit interview results. Or, these observers might generate similar rules but *not* follow them because socially-mediated consequences would be less probable if they did not know their performance mattered to others.

Observers who know that their performance of the task is being evaluated or is important to others may be more likely to follow self-generated rules about their performance because participating in the observation and data collection process could function as an Establishing Operation (EO) for reinforcement. Michael (1982) describes an EO for reinforcement as an environmental event that impacts behavior by momentarily increasing (a) the effectiveness of events as reinforcers and (b) the occurrence of behaviors that have produced those events (reinforcers) in the past (as cited in Miguel, 2013). For example, the reinforcing consequences that the observer has experienced for performing that or a similar task correctly in the past (e.g., praise from a supervisor or researcher) may now become even *more* reinforcing after being asked to observe and evaluate others' performance of this task.

An applied example of this (in more colloquial terms) is when an employee is asked by his supervisor to be in charge of observing and collecting data on his

coworkers' performance of a task that the supervisor wants the observer and his team to improve. Recognizing improvements in his own performance of the targeted task or receiving positive feedback from supervisors and/or peers for doing it well might become more meaningful to this employee, now that he has played an important role (observing and collecting data) in his team's improvement of this task. If these consequences were now more valuable to this employee, he would likely increase his frequency of behaviors that result in these consequences. Therefore, he would probably improve his performance of this task to experience these consequences.

Participation in the observation and data collection process might also function as an EO for punishment or negative reinforcement. This would be when the *aversive* consequences that the individual has experienced for performing that or a similar task incorrectly in the past (e.g., reprimand from a supervisor or researcher) becomes even *more* aversive after being asked to observe and evaluate others' performance of that task. An applied example of this (in more colloquial terms) is similar to the previous example, but the observations/data collection would increase the significance of the *aversive* consequences that the employee has experienced for not performing that or a similar task correctly in the past. In other words, realizing that his performance of the targeted behaviors is not improving, or receiving corrective feedback for performing this task poorly, might become *more* aversive or embarrassing to the employee now that he has played an important role

in his team's improvement of this task. If these aversive consequences were now more significant to this employee, he would likely increase his frequency of behaviors that help him *avoid* these consequences. Thus, he would probably improve his performance of the observed task.

It is also possible that participating in the observation process functions as a discriminative stimulus (SD) for reinforcement and/or punishment for improving and/or not improving one's performance of the observed task. Michael (1982) describes an SD as having 3 defining features: a stimulus change which, (1) given the momentary effectiveness of some particular type of reinforcement (2) increases the frequency of a particular type of response (3) because that stimulus condition has been correlated with an increase in the frequency with which that type of response has been followed by that type of reinforcement (p. 149). For example, imagine that in the past, conditions that have shown employees that the supervisor has increased her focus on a task (e.g., retraining employees or asking some employees to evaluate others' performance of that task) has been correlated with her delivering more positive feedback to employees for performing that task well. If positive feedback from the supervisor is reinforcing to an employee, then any condition that heightens his attentiveness to the supervisor's increased focus on a task would evoke his good performance of that task, since it signals that positive feedback from the supervisor is now more likely to occur if he performs it well.

Therefore, being asked to observe and evaluate others' performance of some task might evoke the observer's good performance of that task because it increases the observer's attentiveness to the supervisor's (or researcher's) heightened focus on that task (like the demand characteristics described in Sasson and Austin, 2005 and Taylor and Alvero, 2012). Previous research on reactivity in work settings also provides some support for the idea that participating in the observation process might function as an SD. For example, earlier research has demonstrated that reactivity can occur and improve an individual's performance of some behavior if stimuli that have been paired with an observer, or the availability of valued consequences contingent on the individual's performance of that behavior, are present (e.g., Brackett, Reid, and Green, 2007; Mowery, Miltenberger, and Weil, 2010). However, as in the MO example, participating in the observation process might not function as an SD for reinforcement for an observer if he is told that his performance of the task will not be observed. If his performance of the task is not observed, then the probability of him receiving positive reinforcement from someone for performing that task well would be low.

### **Purpose of the Current Study**

The behavioral mechanisms of the observer effect cannot be fully understood until information about the conditions under which it occurs and does not occur is clarified. Based on previous findings, it is expected that research that analyzes the role of reactivity in peer observations may help clarify these

conditions. The observer effect is said to have occurred when conducting observations of a behavior improves the observer's subsequent performance of that behavior (Alvero and Austin, 2006). Yet, as Alvero, Rost, and Austin (2008) explained, we still do not know whether informing the observers that *their* performance will also be observed is necessary for this phenomenon to occur. If we begin to find that the observers' behavior does not change after conducting observations when they are *not* informed that they are also being observed, then the current definition of the observer effect would be inaccurate or incomplete.

These findings would have important implications for OBM consultants implementing BBS programs. Results from previous observer effect research suggest that all employees should be involved in the observation and data collection process to experience the benefits of the observer effect. Therefore, OBM consultants currently push for a high percentage of employee participation. However, if we begin to find that the observer effect only occurs for observers who are also being observed and are *aware* of being observed, consultants might change what they recommend regarding peer observation procedures. For example, they might recommend that employees let each other know when they are going to conduct an observation on one another. Additionally, they might recommend that employees and/or supervisors keep track of how often employees are conducting observations *and* being observed, to ensure that all employees participating in data collection can experience the benefits of the observer effect.

To further explore the role of reactivity in the observer effect, the current study will compare the impact of peer observations on participants who *are* informed that their performance of the task is being observed to participants who are *not* informed or led to believe that their performance of the task is being observed. The impact of peer observations will be measured for both groups by examining the extent to which the participants' observations and evaluations of *others'* safe postures during a typing task improve the *participants'* subsequent safe postures during a typing task.

## **Method**

### **Participants and Setting**

Seven students from a southeastern university participated in the study. One participant dropped out of the study during the first phase of the experiment, so his data are not included. Experimenters used a recruitment script (see Appendix A) or the university's SONA research system to recruit participants. Participant inclusion criteria consisted of: (1) individuals who did not have a diagnosed musculoskeletal disorder (MSD) and were not seeking medical attention for chronic body pain or discomfort, and (2) individuals who demonstrated at-risk performance for at least one of the targeted postural behaviors. Prior to the baseline phase, participants were asked if they currently had a diagnosed MSD and whether they were currently seeking medical attention for chronic body pain or discomfort. At-risk performance was assessed for all participants during the baseline phase. If a participant

demonstrated an average of 51% or greater intervals scored as safe for more than two of the postural behaviors after 3 baseline sessions, that individual was excluded from the study. This was done to ensure that participants' behaviors targeted in the study had the opportunity to be improved by the independent variables. Participants were notified during recruitment that an early dismissal was possible, and were told that they would be notified after their first several sessions if this did occur. Participants earned \$8.00 per hour and research credit for participating in the study (see Appendix A).

The study took place in a research room located on the university campus. The room was equipped with two workstations, which each had a computer. One workstation was used for participants to watch and score videos of confederates (the "video task workstation") and the other workstation (the "coding task workstation") was used for participants to complete a coding task, which consisted of inputting data into an Excel spreadsheet. The dependent variables were measured while participants worked at the coding workstation, which was equipped with a computer, a desk, an adjustable chair, document holders, and a footrest. The research room also included a hidden camera for data collection purposes, and an overt camera during the Observations + Overt Camera phase. An ergonomic assessment was conducted for all participants at the beginning of the study to teach them how to use the workstation equipment and optimize the set-up of their workstation.

## **Dependent Variables**

**Postural Behaviors.** Four safe postures were targeted: neck, back/shoulder, elbow angle, and feet. The dependent variable for each postural behavior was the percentage of intervals in which the participant's performance of that posture was scored as safe. The following operational definitions for neck, back/shoulder, and foot position were derived from Sasson and Austin (2005):

1. Neck Position—When sitting, the neck should be aligned with the back; eyes should be level with the screen and document.
2. Back/Shoulder Position—When sitting, the back should be upright, parallel to and up against the back of the chair (not leaning against it). Shoulders should be in line with the back and hips, not slouched forward or arched backward.
3. Elbow angle—When sitting, the angle at the elbow should be at least 90 degrees with the forearms.
4. Foot Position—When sitting, both feet should be flat on the floor (ball of foot and heel should touch floor or foot rest if a foot rest is used).

**Microbreak Stretches.** Another dependent variable was the participants' performance of microbreak stretches during their coding task sessions. Microbreaks have been suggested as a way to lower an individual's exposure to ergonomic injury risk that can occur from prolonged exertion of postural muscles while sitting (Stanford University Department of Environmental Health and Safety, 2004).



Stretches for three areas of the body were targeted: shoulders, neck, and lower back. A correct microbreak was defined as taking a break from the coding task and performing one or multiple stretches after working on the coding task for a maximum of 6 minutes since beginning the task or since the last microbreak. If a participant took a break from the task for less than five seconds, it was not scored as a microbreak.

The following definitions for each microbreak stretch were derived from the Stanford University Department of Environmental Health and Safety:

1. Shoulder stretches

- a. Shoulder Circles: Lift your shoulders toward your head. Pinch the shoulder blades to roll the shoulders back, and let the shoulders drop down to the starting position. Try to move the shoulders in a circular fashion. Repeat as desired.
- b. Shoulder Shrugs: Lift your shoulders toward your head. Hold for a 1-3 seconds and relax. Repeat as desired.

2. Neck stretches

- a. Head Turn: Slowly turn head to side and hold for 10 seconds. Alternate sides and repeat several times.
- b. Head Tilt: Slowly tilt head to side and hold for 5-10 seconds. Alternate sides and repeat several times.

### 3. Lower back stretch

- a. Hip and Shoulder Lean: Stand from chair. With hands on hips and feet about shoulder width apart, slowly lean hips forward and shoulders slightly back. Hold the stretch for 5-10 seconds.

### **Data Collection**

Participants were videotaped with a hidden video camera (Observations + No Overt Camera phase) or both an overt camera and a hidden camera (Observations + Overt Camera phase) while they completed a coding task at the computer for 25 minutes (See *Group Assignment*). Participants were allowed to schedule a maximum of 3 sessions per day, and were reminded at the beginning of each session that they were allowed and encouraged to take a break at any time if needed. Experimenters scored participants' postures and microbreak stretches from videos captured by the hidden video camera. Although participants were also videotaped with an overt camera in the Observations + Overt Camera phase, only footage from the hidden video camera was used to score participants' performance of the dependent variables. This was done to ensure that all performance was scored from the same angle.

To collect data on participants' postural behaviors, researchers used a 120-second momentary time sampling (MTS) procedure. MTS interval lengths of 120 seconds were selected based on findings from Alvero, Rappaport, and Taylor

(2011). This study compared the estimation of different MTS interval lengths to actual safety performance of three postural behaviors, and found that the use of MTS with longer intervals showed considerable accuracy when used to measure postural behaviors. In the current study, the experimenter paused the video and scored which postures were safe and which are unsafe at the end of each 120-second interval. Experimenters also took a screen shot of the video at each pause so that a secondary observer could collect interobserver agreement (IOA) data. Data for each postural behavior was combined to reflect the participant's combined average safety score during each session.

If the end of a 120-second interval occurred when the participant was taking a microbreak or break, the researcher scored the participants' postural behaviors 3 seconds after he or she resumed working on the coding task (i.e., once the participant placed his or her hands over the computer keyboard). If the break lasted longer than one minute, that interval was not scored. This was done to ensure that at least one minute elapsed between each score. To collect data on participants' microbreaks, experimenters noted the time on the video that the participant began and stopped taking a break, whether the participant stood up, and whether a stretch was performed. This was done so that data on the frequency and duration of each microbreak and the duration between each microbreak could be captured.

## **Procedure**

**Informed Consent and Screening.** The informed consent process occurred prior to each participant's first baseline session. An experimenter met with the participant and read the Informed Consent Script (see Appendix B) and reviewed the consent form (see Appendix C). Information about the general purpose of the study was vague in order to minimize any unintended reactivity. Individuals were informed that they would later be randomly assigned to either a participant or data collector role if they chose to participate in the study by signing the consent form. They were also told that their roles might change during the study, and that they would be notified if it does. Finally, individuals were informed that their participation might involve coding data into excel spreadsheets and/or collecting data from videos. They were then interviewed about MSDs or chronic body pain, and were told that this is a standard requirement since participation requires sitting down and working on a computer. Those who did not have an MSD or chronic body pain/discomfort were given the opportunity to review and sign, or refuse to sign the consent form. All participants met the inclusion criteria, so none were excluded from participating.

**Group Assignment.** All participants were randomly assigned to either group A or group B. The primary difference between these groups was that group A was informed immediately before their first session in their first observation phase (Observations + Overt Camera for group A) that they were participants in the study

and that their safety performance would be examined, whereas group B was informed immediately before their first session in their first observation phase (Observations + No Overt Camera for group B) that they were data collectors for the study. They were *not* informed that their safety performance would be examined (See *Observation*). Immediately before their first session in the second Observation phase, roles for participants in both groups were reversed (See *Role Reversal*). Participants in group A were told that they would still be performing the same tasks, but that they were now data collectors and that their performance of the targeted behaviors would no longer be observed. Participants in group B were told that they would still be performing the same tasks, but that they were now participants in the study and their performance of the targeted behaviors would now be observed.

Participants in group A were exposed to the experimental phases in the following order: Baseline (A), Observations + Overt Camera (B), Observations + No Overt Camera (C). Participants in group B were exposed to the experimental phases in the following order: Baseline (A), Observations + No Overt Camera (C), Observations + Overt Camera (B). Participants were filmed with an overt camera and a hidden camera while completing the coding task during phases in which they were assigned a participant role (Observations + Overt Camera phase). This overt camera was used so that participants would continue to believe they were being observed throughout the phases in which they were assigned as a participant.

**Information and Training.** Before participants' first baseline session, an ergonomic assessment was conducted to teach them how to use the workstation equipment so that they could optimize the set-up of their workstation. The assessment was based on the Occupational Safety and Health Association (OSHA) Workstation Posture Checklist (OSHA, 2004b, based on Gravina, 2006). This was done to ensure that participants could adjust the workstation equipment to positions that would allow them to sit safely. A workstation check was completed at the beginning of all participants' sessions to ensure that the appropriate equipment was available.

The researcher then used an Information Script (see Appendix D) to inform participants of the trainings they would receive that day and the coding task that they would be working on throughout the study. First, the researcher gave them information and training about the coding task. They were told that the coding task involves transferring data from completed paper-and-pencil data sheets to a formatted Excel spreadsheet. The researcher trained participants on how to input data into the excel spreadsheet by demonstrating how to do it and then having the participants practice. Participants also received printed instructions to use as a guide during the training and during their coding sessions throughout the remainder of the experiment.

Next, participants received information and training about using safe postures and taking microbreaks while working on the computer. For this training,

the researcher gave each participant a handout containing definitions for correct microbreak stretches and postural behaviors and how to perform each safely (see Appendix G). Each participant also watched a brief PowerPoint presentation that reviewed each target postural behavior, how to adjust the workstation for each, and microbreak stretches.

Participants were then asked to schedule days/times to come in for 25-min coding task sessions. Participants did not begin conducting observations during baseline so that the effects of information and training on the target behaviors alone could be separated from the effects of conducting observations. Participants were not notified at this time that they would later be scoring videos; they were notified immediately prior to their first session of their first observation phase when they were assigned their role.

**Baseline.** Baseline sessions were approximately 25 min in length. At the beginning of each session, the researcher gave the participant a stack of completed datasheets to transfer into the excel spreadsheet. A copy of the data coding instructions and the safety behavior definitions handout remained on the coding task workstation desk for every session throughout the study. Participants were told to complete as much as they could during their session, but that it did not all need to be completed that day. The researcher told participants that they would be notified when their session was over. They were also reminded that they are allowed and encouraged to take breaks if they started to feel tired or uncomfortable.

**Observations.** This section describes the first phase of conducting observations for both groups of participants (i.e., Observations + Overt Camera for group A and Observations + No Overt Camera for group B). The following procedures were used for both groups of participants, except participants in group A were assigned the role of a participant and had overt camera present while they completed the coding task during each session, whereas participants in group B were assigned the role of a data collector and did not have an overt camera present during their sessions.

Prior to their first session in their first Observation phase, the researcher told participants that they would begin scoring videos of others' safe postures and microbreaks at the beginning of their next several sessions. The researcher then trained each participant on how to collect the data by scoring a video together. The researcher scored the first 2 intervals together, and then had the participant score the last few on his or her own, while the researcher provided feedback. After scoring the video together, the researcher asked the participants if they had any questions and whether they wanted to score another video together for more practice. All participants demonstrated that they could score the video during the training and did not ask for more practice.

Immediately following the training, the researcher used a Role Assignment Script (see Appendix E) to inform each participant of his or her role in the study. Participants in Group A were assigned the role of a participant. They were told that



being a participant meant that they should try their best to use safe postures and microbreaks while they worked on the coding task because their performance would be videotaped and then scored by a data collector. Participants in group B were assigned the role of a data collector. They were *not* told to try their best to use safe postures and microbreaks while working on the coding task, and were *not* told that their performance of these behaviors would be videotaped and scored. Group B was told that being a data collector simply meant that they were going to be watching and scoring videos of other people's safety performance.

Each session in this phase lasted approximately 30-40 minutes (5-10 minutes to score the video and 25 minutes for the coding task). At the beginning of each session during this phase, participants were asked to sit at the video task workstation to watch and score an 8-10 minute video of a "participant" working on a computer. Each video that the participants watched during the observation phases actually depicted one of two confederates typing on a computer in an office setting for approximately 8-10 minutes. Confederates were used for these videos so that the researchers could manipulate the percentage of intervals with correct and incorrect postures and microbreaks depicted in the videos. This was done to ensure that all participants got practice discriminating between different variations of correct and incorrect performance when scoring the videos. All of these videos were recorded in a room other than the research room used in the study to prevent participants from identifying where the hidden camera was.

Participants were asked to collect data on the same target safety behaviors (postural behaviors and microbreaks) introduced to them in the information and training phase. They were asked to score the individual's safe postures only for the first 5 minutes of the video, using a 30-second MTS procedure. During the training, they were taught to pause the video at the end of each 30-second interval to collect data on safe postures. They were asked to score the individual's microbreaks by using the same procedures as the researchers (i.e., marking the time that the video says when the participants starts and stops a microbreak, and marking whether a stretch was performed). Participants were given the same safety handout from the information/training and baseline phases (Appendix G). They were also given a blank data sheet to evaluate and score the safety performance of the confederates in the video. Participants watched and scored one video at the beginning of every session during this phase. All participants watched watch the videos in the same order, with the exception of the last 2 (see *Microbreak Salience*).

After scoring the video, participants were given a stack of completed datasheets and were asked to begin the coding task at the coding task workstation for approximately 25 minutes. The remainder of the session was the same as in baseline, with the addition of the overt camera for participants in the Observations + Overt Camera condition (Group A). As they were setting up their workstation to begin the coding task, participants in this condition were reminded that their safe postures and microbreaks were going to be videotaped, and that they should try to

do their best. The experimenter then walked over to the camera and turned it on, and told the participants that the camera was now recording.

**Role Reversal.** This section describes the second phase of conducting observations for both groups of participants (i.e., Observations + no overt camera for group A and Observations + overt camera for group B). Procedures during this phase were identical to those described in the first observation phase, with the exception of the changes described below. Additionally, the video/observation task training was not repeated.

At the beginning of their first session during this phase, the researcher notified participants of their changing role in the study using a script (See Appendix F). Participants in group A were notified that they were no longer participants in the study, and that they were now data collectors. They were told that they would still be working on the same type of tasks (the video and coding tasks), but that their performance of the targeted behaviors (safe postures and microbreaks) would no longer be videotaped and scored by anyone. Additionally, the overt camera was no longer in the room while they completed the coding task throughout this phase.

Participants in group B were notified that they were now going to be participants in the study. They were told that they would still continue to work on the same type of tasks (the video and coding tasks), but that their performance of the targeted behaviors (safe postures and microbreaks) would be videotaped while they worked on the coding task and would later be scored by a data collector.

Additionally, the overt camera was in the room while they completed the coding task throughout this phase. They were also reminded of the camera and to do their best at the beginning of each coding task session.

**Microbreak Salience.** A change was made to some of the videos that participants in group B watched during their second observation phase, after noticing that microbreaks were not improving. During their last 2 sessions in the Observations + Overt Camera phase, participants in group B watched a video of a confederate who stood up and took a microbreak at the end of one of the 30-sec intervals during the first 5 minutes in the video. Before watching these 2 videos, participants had only scored videos of 2 confederates who performed microbreaks *after* the first 5 minutes of the video, or did not perform microbreaks at all. These videos were introduced to Group B to examine whether a more salient change in the confederate's performance of microbreaks would impact their subsequent performance of microbreaks. Although participants in Group A did not improve their microbreaks either, this change was not implemented for them because the videos were created when most of the participants had already completed the first observation phase of the study. Therefore, Group A had already finished the Observations + Overt Camera condition.

**Exit Interview.** At the conclusion of the study, participants were asked a series of questions about the study, why they believed they performed as they did, and how they believed the observations impacted their safety behavior (see Appendix H).

**Debriefing and Consent.** Once all participants completed the study, they were debriefed individually in a private room at the university. The researcher used a script (see Appendix I) to inform the participants of the primary purpose and hypothesis of the study, and why any deception was necessary. The researcher also offered to show each participant his or her individual data. Participants were reminded that personal identifiers would remain confidential to anyone outside of the research team. Participants were also encouraged to express any questions, comments, and/or concerns about the study.

### **Experimental Design**

This study used a within-subjects multiple-baseline ABC design, with B and C counterbalanced across groups (A: baseline, B: observations + overt camera, C: observations + no overt camera for group A; A: baseline, C: observations + no overt camera, B: observations + overt camera for group B).

### **Reliability**

Interobserver agreement (IOA) was calculated on the participants' performance of the target behaviors. At least 30% of each participant's sessions was scored by two trained researchers independently. To collect IOA data on a

participant's postural behaviors in a session, a secondary observer scored the participant's postural behaviors in the screen shots that the primary observer captured. To collect IOA data on a participant's use of microbreaks in a session, a secondary observer watched the videos for that session.

IOA between the researchers was calculated by dividing the number of agreements by the number of agreements plus disagreements, and multiplying by 100 to get a percentage. An agreement was defined as any interval in which both researchers scored the same mark for the same behavior (safe or unsafe for postural behaviors and yes or no for microbreaks). A score was calculated for each target postural behavior. Each video that received an IOA percentage less than 80% was flagged for further evaluation. The lead researcher and trained research assistant met to review and discuss the screenshots for that session until a consensus was reached. They then scored another video independently and compared results for practice until an IOA percentage of at least 80% occurred.

### **Independent Variable Integrity**

The videos of confederates were given to participants in the same order so that all participants were exposed to the same sequence (with the exception of the last 2 for Group B). Participants were also required to initial, date, and turn in the data sheet to a researcher immediately following the completion of the video.

Another measure of independent variable integrity was the ergonomic assessment at the beginning of the study and the workstation check prior to each session.

## **Results**

Figures 1 and 2 display the combined safe posture performance for participants in group A and group B, respectively. Results for each individual posture performance can be found in figures 3-6 (group A) and figures 7-10 (group B). Figures 11 and 12 display the results of the intervention on participants' microbreaks for group A and group B, respectively. Results will be described in detail for each participant.

### **Participant A1**

#### **Safe Posture Performance.**

***Combined Safe Postures.*** The top panel of Figure 1 illustrates the percentage of intervals scored as safe for all postures combined for participant A1. During baseline, A1's combined safe posture performance averaged 37% (SD: 15.6, range 19% to 46%) and improved to 66.6% (SD: 7.1, range 58% to 79%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for all postures combined was 42.3% (SD: 9.6, range 31% to 63%).

***Neck.*** The top panel of Figure 3 illustrates the percentage of intervals scored as safe for participant A1's neck posture. Percentage of intervals scored as safe for neck posture averaged 22% (SD: 12.8, range 8% to 33%) during baseline and improved to 34% (SD: 26.5, range 0% to 83%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No

Overt Camera phase, average percent safe for neck posture was 20.6% (SD: 16.5, range 8% to 58%).

***Back/Shoulder.*** The top panel of Figure 4 illustrates the percentage of intervals scored as safe for participant A1's back/shoulder posture. Percentage of intervals scored as safe for back/shoulder posture averaged 38.7% (SD: 41.8, range 0% to 83%) during baseline and improved to 98.9% (SD: 3, range 92% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for back/shoulder posture was 69.9% (SD: 26, range 42% to 100%).

***Foot.*** The top panel of Figure 5 illustrates the percentage of intervals scored as safe for participant A1's foot position. Percentage of intervals scored as safe for foot position averaged 22.3% (SD: 17.6, range 8% to 42%) during baseline and improved to 39.3% (SD: 32.1, range 0% to 75%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for foot position was 16.7% (SD: 21.4, range 0% to 67%).

***Elbow.*** The top panel of Figure 6 illustrates the percentage of intervals scored as safe for participant A1's elbow angle. Percentage of intervals scored as safe for elbow angle averaged 63.7% (SD: 26.9, range 33% to 83%) during baseline and improved to 94.1% (SD: 9.2, range 75% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations +



No Overt Camera phase, average percent safe for elbow angle was 63% (SD: 22.8, range 17% to 92%).

**Microbreak Performance.** The top panel of Figure 11 illustrates the number of microbreaks performed by participant A1. Zero microbreaks were performed across all phases. Data on microbreaks were not included for her fourth and fifth sessions in the Observations + No Overt Camera phase because the video camera stopped recording during the first half of these sessions.

## **Participant A2**

### **Safe Posture Performance.**

**Combined Safe Postures.** The middle panel of Figure 1 illustrates the percentage of intervals scored as safe for all postures combined for participant A2. During baseline, A2's combined safe posture performance averaged 48.5% (SD: 13.4, range 25% to 63%) and improved to 75.7% (SD: 5.9, range 68% to 83.3%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for all postures combined was 60.3% (SD: 8.6, range 50% to 69%). These calculations do not include data for her foot positioning in her fourth and fifth sessions in the baseline phase and her first through third sessions in the Observations + No Overt Camera. Experimenters could not collect data on her foot position during these sessions because her feet were obscured by an object in the video recordings.

**Neck.** The middle panel of Figure 3 illustrates the percentage of intervals scored as safe for participant A2's neck posture. Percentage of intervals scored as safe for neck posture averaged 11.2% (SD: 10.2, range 0% to 25%) during baseline and improved to 33.8% (SD: 23.9, range 8% to 70%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for neck posture decreased to 11.3% (SD: 6.9, range 0% to 17%).

**Back/Shoulder.** The middle panel of Figure 4 illustrates the percentage of intervals scored as safe for participant A2's back/shoulder posture. Percentage of intervals scored as safe for back/shoulder posture averaged 80.7% (SD: 20.8, range 42% to 100%) during baseline and improved to 100% (SD: 0, range 100% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for back/shoulder posture remained at 100% (SD: 0, range 100% to 100%).

**Foot.** The middle panel of Figure 5 illustrates the percentage of intervals scored as safe for participant A2's foot position. Percentage of intervals scored as safe for foot position averaged 18.8% (SD: 37.5, range 0% to 75%) during baseline and improved to 69.3% (SD: 34.6, range 17% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for foot position was 8.3% (SD: 8.5, range 0% to 17%). These calculations also do not include data for her foot

positioning in her fourth and fifth sessions in the baseline phase and her first through third sessions in the Observations + No Overt Camera.

***Elbow.*** The middle panel of Figure 6 illustrates the percentage of intervals scored as safe for participant A2's elbow angle. Percentage of intervals scored as safe for elbow angle averaged 71% (SD: 21.6, range 42% to 92%) during baseline and improved to 98.7% (SD: 3.3, range 92% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for elbow angle was 93.2% (SD: 13.2, range 67% to 100%).

***Microbreak Performance.*** The middle panel of Figure 11 illustrates the number of microbreaks performed by participant A2. Zero microbreaks were performed across all phases. Data on microbreaks were not included for her fourth session in the Observations + Overt Camera phase because the video camera stopped recording during the first half of this session.

### **Participant A3**

#### **Safe Posture Performance.**

***Combined Safe Postures.*** The bottom panel of Figure 1 the percentage of intervals scored as safe for all postures combined for participant A3. During baseline, A3's combined safe posture performance averaged 47.7% (SD: 10.1, range 29.2% to 61%) and improved to 76.5% (SD: 6.8, range 67% to 85%) during the Observation + Overt Camera phase. When the overt camera was removed in the

Observations + No Overt Camera phase, average percent safe for all postures combined was 56.7% (SD: 2.5, range 54% to 59%).

**Neck.** The bottom panel of Figure 3 illustrates the percentage of intervals scored as safe for participant A3's neck posture. Percentage of intervals scored as safe for neck posture averaged 0% (SD: 0, range 0% to 0%) during baseline and improved to 19.2% (SD: 14.1, range 0% to 40%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for neck posture was 33% (SD: 5.2, range 27% to 36%).

**Back/Shoulder.** The bottom panel of Figure 4 illustrates the percentage of intervals scored as safe for participant A3's back/shoulder posture. Percentage of intervals scored as safe for back/shoulder posture averaged 70.2% (SD: 34.8, range 0% to 100%) during baseline and improved to 100% (SD: 0, range 100% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, average percent safe for back/shoulder posture remained at 100% (SD: 0, range 100% to 100%).

**Foot.** The bottom panel of Figure 5 illustrates the percentage of intervals scored as safe for participant A3's foot position. Percentage of intervals scored as safe for foot position averaged 20.9% (SD: 12.1, range 8% to 45%) during baseline and improved to 87.3% (SD: 19.6, range 50% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations +

No Overt Camera phase, average percent safe for foot position was 0% (SD: 0, range 0% to 0%).

***Elbow.*** The bottom panel of Figure 6 illustrates the percentage of intervals scored as safe for participant A3's elbow angle. Percentage of intervals scored as safe for elbow angle averaged 99.1% (SD: 2.7, range 92% to 100%) during baseline and 100% (SD: 0, range 100% to 100%) during the Observation + Overt Camera phase. When the overt camera was removed in the Observations + No Overt Camera phase, percent safe for elbow angle averaged 94% (SD: 5.2, range 91% to 100%).

**Microbreak Performance.** The bottom panel of Figure 11 illustrates the number of microbreaks performed by participant A3. Zero microbreaks were performed across all phases.

## **Participant B1**

### **Safe Posture Performance.**

***Combined Safe Postures.*** The top panel of Figure 2 illustrates the percentage of intervals scored as safe for all postures combined for participant B1. B1's combined safe posture performance averaged 34% (SD: 3.6, range 31% to 38%) during baseline and remained at 34% (SD: 7.5, range 27% to 45%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for all postures combined averaged 39.7% (SD: 8.3, range 29.5% to 55%).

**Neck.** The top panel of Figure 7 illustrates the percentage of intervals scored as safe for participant B1's neck posture. Percentage of intervals scored as safe for neck posture averaged 0% (SD: 0, range 0% to 0%) during baseline and 2.8% (SD: 4.4, range 0% to 9%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for neck posture averaged 4.2% (SD: 6.7, range 0% to 18%).

**Back/Shoulder.** The top panel of Figure 8 illustrates the percentage of intervals scored as safe for participant B1's back/shoulder posture. Percentage of intervals scored as safe for back/shoulder posture averaged 25% (SD: 25, range 0% to 50%) during baseline and 17.7% (SD: 25, range 0% to 64%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, average percent safe for back/shoulder posture was 40.1% (SD: 33.9, range 9% to 100%).

**Foot.** The top panel of Figure 9 illustrates the percentage of intervals scored as safe for participant B1's foot position. Percentage of intervals scored as safe for foot position averaged 11% (SD: 19, range 0% to 33%) during baseline and increased to 24% (SD: 30.8, range 0% to 64%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, average percent safe for foot position was 13.2% (SD: 26, range 0% to 80%).

***Elbow.*** The top panel of Figure 10 illustrates the percentage of intervals scored as safe for participant B1's elbow angle. Percentage of intervals scored as safe for elbow angle averaged 97.3% (SD: 4.6, range 92% to 100%) during baseline and 95.5% (SD: 11, range 73% to 100%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for elbow angle averaged 100% (SD: 0, range 100% to 100%).

**Microbreak Performance.** The top panel of Figure 12 illustrates the number of microbreaks performed by participant B1. Zero microbreaks were performed across all phases.

## **Participant B2**

### **Safe Posture Performance.**

***Combined Safe Postures.*** The middle panel of Figure 2 illustrates the percentage of intervals scored as safe for all postures combined for participant B2. B2's combined safe posture performance averaged 23.3% (SD: 28.3, range 2% to 66%) during baseline and 30.8% (SD: 9.5, range 2% to 48%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for all postures combined averaged 37% (SD: 15.1, range 25% to 61%).

***Neck.*** The middle panel of Figure 7 illustrates the percentage of intervals scored as safe for participant B2's neck posture. Percentage of intervals scored as

safe for neck posture averaged 9.2% (SD: 9.4, range 0% to 25%) during baseline and 8.4% (SD: 9, range 0% to 25%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, average percent safe for neck posture was 19.4% (SD: 14.9, range 10% to 45%).

***Back/Shoulder.*** The middle panel of Figure 8 illustrates the percentage of intervals scored as safe for participant B2's back/shoulder posture. Percentage of intervals scored as safe for back/shoulder posture averaged 20.8% (SD: 34.8, range 0% to 83%) during baseline and 20.9% (SD: 29.7, range 0% to 67%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for back/shoulder posture averaged 27% (SD: 32, range 0% to 82%).

***Foot.*** The middle panel of Figure 9 illustrates the percentage of intervals scored as safe for participant B2's foot position. Percentage of intervals scored as safe for foot position averaged 33.3% (SD: 51.6, range 0% to 100%) during baseline and 11.4% (SD: 10.8, range 0% to 33%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for foot position averaged 28% (SD: 23.4, range 0% to 60%).

***Elbow.*** The middle panel of Figure 10 illustrates the percentage of intervals scored as safe for participant B2's elbow angle. Percentage of intervals scored as



safe for elbow angle averaged 30.8% (SD: 27.9, range 0% to 75%) during baseline and increased to 83.1% (SD: 10.2, range 67% to 92%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for elbow angle averaged 72.8% (SD: 17.6, range 44% to 90%).

**Microbreak Performance.** The middle panel of Figure 12 illustrates the number of microbreaks performed by participant B2. Zero microbreaks were performed across all phases.

### **Participant B3**

#### **Safe Posture Performance.**

**Combined Safe Postures.** The bottom panel of Figure 2 illustrates the percentage of intervals scored as safe for all postures combined for participant B3. During baseline, B3's combined safe posture performance averaged 17.4% (SD: 8.5, range 5% to 33%) and improved to 30.5% (SD: 6.8, range 20% to 40%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, average percent safe for all postures combined was 54% (SD: 5.3, range 50% to 60%).

**Neck.** The bottom panel of Figure 7 illustrates the percentage of intervals scored as safe for participant B3's neck posture. Percentage of intervals scored as safe for neck posture averaged 1% (SD: 5.4, range 0% to 18%) during baseline and averaged 0% (SD: 0, range 0% to 0%) during the Observation + No Overt Camera

phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for neck posture averaged 6% (SD: 11.5, range 0% to 20%).

***Back/Shoulder.*** The bottom panel of Figure 8 illustrates the percentage of intervals scored as safe for participant B3's back/shoulder posture. Percentage of intervals scored as safe for back/shoulder posture averaged 2.4% (SD: 5.7, range 0% to 18%) during baseline and averaged 48.7% (SD: 25.5, range 20% to 75%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for back/shoulder posture averaged 83.7% (SD: 11.8, range 70% to 91%).

***Foot.*** The bottom panel of Figure 9 illustrates the percentage of intervals scored as safe for participant B3's foot position. Percentage of intervals scored as safe for foot position averaged 17% (SD: 25.7, range 0% to 83%) during baseline and averaged 19.7% (SD: 19, range 0% to 50%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations + Overt Camera phase, percent safe for foot position averaged 64.7% (SD: 35, range 30% to 100%).

***Elbow.*** The bottom panel of Figure 10 illustrates the percentage of intervals scored as safe for participant B3's elbow angle. Percentage of intervals scored as safe for elbow angle averaged 47.6% (SD: 18.3, range 18% to 83%) during baseline and averaged 53.8% (SD: 14.4, range 40% to 73%) during the Observation + No Overt Camera phase. When the overt camera was added in the Observations +

Overt Camera phase, percent safe for elbow angle averaged 61.7% (SD: 7.6, range 55% to 70%).

**Microbreak Performance.** The bottom panel of Figure 12 illustrates the number of microbreaks performed by participant B3. Zero microbreaks were performed across all phases.

### **Exit Interview**

All participants were asked a series of questions during an exit interview at the completion of the study.

Q1: What did you think the study was about? Answers:

A1: Understanding peoples' postures.

A2: Putting information into a computer and learning about how other people work on the computer...their postures and breaks.

A3: Posture while working at a computer.

B1: Learning about people's postures while they are working.

B2: How posture affects your typing productivity/efficiency.

B3: I don't know.

Q2: Why did you think you were asked to watch videos and collect data on others' safety performance? Answers:

A1: To get a score of their performance that would later be entered into spreadsheets. I thought these scores were related to the data I was entering for the coding task.

A2: To see how other people's postures are while working on the computer and to see if other people take breaks and how often they do.

A3: To see if it would affect my posture while inputting data during the coding task.

B1: To show you what you were doing wrong, and to help you improve.

B2: To see if it would influence my performance.

B3: To study whether they have good postures and microbreaks while working on a computer.

Q3a. When you were watching and scoring the videos, did it make you *think about* your own safe postures and microbreaks? Answers:

A1: No, not really. Not in the moment.

A2: No, not while watching the videos.

A3: No, not while watching the videos and scoring the data.

B1: Yeah, a little bit.

B2: Yes, a lot. Sometimes I would try to correct my posture while I was

watching and scoring the videos.

B3: No.

Q3b. What about after, when you started working on the coding task? Did

you **think about** your safe postures and microbreaks then, as you were working on the computer? Answers:

A1: Yes, I did. Since I was sitting there for longer than 5 min, I thought about my posture.

A2: Yes, but mainly when I was being videotaped. I mainly thought about my back, but not really my elbows or my feet.

A3: Yes.

B1: Yes.

B2: Yes.

B3: No.

Q3c. Did you **think more about** your safety performance when you were assigned as a participant and the camera was filming you? Answers:

A1: Yes, because I thought my performance was being watched and evaluated. And I thought it was for the study.

A2: Yes, I definitely paid attention to it more.

A3: Yes.

B1: A little bit more, yes.

B2: I don't think so. Shortly after you turned the camera on, I would forget about it because I was more focused on entering the data for the coding task.

B3: No, not particularly.

Q4. Did you *try to improve* your own performance of safe postures and microbreaks at all during the study? Why or why not? Answers:

A1: Yes, only for postures and not for microbreaks, and only when the camera was on. I didn't want to do the microbreaks during the coding task because I had a flow and I wanted to be productive. I thought my productivity was important to the study.

A2: Yes, I mainly tried to improve my back posture. I tried to improve it the whole time (even when I was just a data collector) but I focused on it more when I was being videotaped. I focused on my back posture the most because I used to get lower back pain and my mom would always tell me to sit and stand straight. But I also started focusing more on other postures (feet) when I was being filmed. I wanted to try and improve them since I thought other people would be watching and scoring them. I didn't want to take microbreaks because I thought one of the purposes of the study was related to my productivity of entering the data for the coding task.

A3: Yes, but only my postures, not microbreaks. I didn't feel like I needed to take breaks, but I've always felt that I had bad posture, so I figured this was a good time to work on that.

B1: There were some things I tried to improve...like my elbows, or fixing my feet if they weren't flat. I felt like I was never slouching

badly, so I didn't really change what I did. I just wanted to do whatever I was most comfortable with. I thought that was best.

B2: Sometimes I would try to correct my posture while I was watching and scoring the videos. I thought about and tried to improve my feet while I was working on the coding task to see if it somehow affected my typing productivity. I didn't try to improve any other postures because I thought they were fine. I also started to take more stretch breaks.

B3: Yes, I think I did throughout the study, because you told me to do my best.

Q5. Did you think that **your performance** of safe postures and microbreaks was important to the study? Answers:

A1: Yes, I thought it was the entire time.

A2: No, not during the study. I thought it had something to do with my typing performance for the coding task.

A3: Yes.

B1: I figured it probably was.

B2: Yes.

B3: No.

Q6. Did participating in this study make you think more about your posture and microbreaks while working on computer tasks outside of this study?

Answers:

A1: No, not really. Just in here.

A2: I don't remember. I don't remember really having an opportunity to think more about it because I haven't worked on a computer for a long period of time outside of this study. But I think I am going to be focusing on it more often now when I am those situations (working on a computer for a long period of time).

A3: Yes. I don't have any specific examples, but I feel like it has in general. I think about it more often now and I try to improve it when I think about it.

B1: Yes, it did. Sometimes I would think about it while I was in class, and I would try to improve it while I was in there.

B2: Yes. I have "lab hours" for my class where I have to sit in front of the computer, so I actually think about and try to improve my posture then, but only my postures, not microbreaks. And I only try to improve my foot position, because I feel that everything else is fine.

B3: Yes, I think it did.

Q7. Do you think observing and scoring other people's performance is a reasonable intervention for improving the observer's safe performance?

Why or why not? Answers:



A1: Unavailable

A2: Yes, because it will help the observers learn the proper techniques and common mistakes people make.

A3: Yes, because if you're scoring other people's performance and you're trying to help them improve, you don't want to be a hypocrite, so it should make try to improve yours.

B1: Yes, because sometimes you don't know what you are doing right or wrong, but then when you watch someone else, you are able to see it from a different perspective.

B2: Unavailable

B3: Unavailable

### **Reliability**

Interobserver agreement (IOA) for safe postures was calculated using point-by-point agreement for at least 30% of sessions in each phase for all participants. Agreement for safe posture performance averaged 92.54% (range: 81.25% to 100%) when averaged across all postural behaviors by session. IOA was also calculated for microbreaks by using point-by-point agreement for 30% of sessions in each phase for all participants. Agreement for microbreaks was 100%.

## **Discussion**

The primary purpose of this study was to determine whether conducting observations of others' safe postures and microbreaks would improve the observers' subsequent safe postures and microbreaks during a typing task, and whether reactivity to being observed would make these improvements more robust. The study yielded different results across groups for safe postures, and similar results across groups for microbreaks. These results will be discussed in detail in the following sections.

### **Safe Posture Performance**

**Group A.** Participants in Group A experienced the experimental phases in the following order: A (baseline), B (Observations + Overt Camera), C (Observations + No Overt Camera). Therefore, when these participants began conducting observations after baseline, they were told that they were “participants” in the study, meaning that their safety performance would also be observed and scored. A noticeable camera was also placed near them while they worked on the typing task. In the last phase, they were told that their role had been changed to a data collector, meaning that they would still observe participants' safety performance, but their safety performance would no longer be observed. The noticeable camera was also removed from the room when they worked on the typing task.

Conducting observations of others' safety performance appeared to produce improvements in Group A's overall safe posture performance, with the largest improvements seen in the reactivity condition (B: Observations + Overt Camera) when both observation conditions are compared to baseline. Table 1 lists the absolute change in average performance for combined, neck, back/shoulder, foot, and elbow postures from Baseline to Observations + Overt Camera, Baseline to Observations + No Overt Camera, and Observations + Overt Camera to Observations + No Overt Camera for participants in Group A. Absolute percentage point increase in average combined safe posture performance from baseline to the Observations + Overt Camera phase was 30% for participant A1, 27% for participant A2, and 29% for participant A3. Close inspection of the graphs shows an immediate increase in level for the composite safe posture score for all three participants in Group A when the Observations + Overt Camera phase was added after baseline. Participant A3's combined safe posture performance remained on an increasing trend throughout the Observations + Overt Camera phase. A slight increasing trend was observed for participant A1, and no trend was observed for participant A2.

Improvements from baseline to the Observation + No Overt Camera phase (the last phase for Group A) were smaller than those observed in the Observation + Overt Camera phase. Absolute percentage point increase in average combined safe posture performance from baseline to the Observations + No Overt Camera phase

was 5% for participant A1, 12% for participant A2, and 9% for participant A3.

Visual inspection of the data shows that the levels of performance for all participants during the Observation + No Overt Camera phase were lower than the levels observed during the Observation + Overt Camera phase, but remained slightly above their level of performance during baseline. Additionally, all 3 participants' performance was on a decreasing trend throughout the Observation + No Overt Camera phase.

When considered across the three participants in Group A, twelve postures were exposed to the observation phases. Conducting observations with the overt camera present produced substantial improvements in 5 of the 12 postures, defined as a mean percentage point increase of 30% or more from baseline to the Observation + Overt Camera phase. These include participant A1's back/shoulder and elbow postures, participant A2's foot posture, and participant A3's back/shoulder and foot postures. Additionally, improvements in average performance of 10% or more were also noted for participant A1's neck and foot posture, participant A2's neck, back/shoulder, and elbow posture, and participant A3's neck posture. It should be noted that participant A3's elbow posture during baseline averaged 99%, preventing an opportunity to be improved by the independent variables. Caution is also encouraged when interpreting some of these improvements. Close inspection of the graphs shows that participant A1's and A2's back/shoulder position and participant A1 and A2's elbow position were already on

an increasing trend during baseline. Additionally, participant A2's neck posture was on a decreasing trend from the middle to the end of the Observations + Overt Camera phase.

When the overt camera was removed in the last phase, performance of 11 of the 12 postures decreased. Three of these postures yielded substantial decreases, defined as a mean percentage point decrease of 30% or more from the Observations + Overt Camera phase to the Observations + No Overt Camera phase. These include participant A1's elbow position, participant A2's foot position, and participant A3's foot position. Decreases in average performance of 10% or more were also noted for participant A1's neck, back/shoulder, and foot position and participant A2's neck position.

Some of these calculations should be interpreted with caution. Close inspection of the graphs reveal a decreasing trend in participant A2's neck posture and high variability in participant A2's and A3's foot position during the Observations + Overt Camera phase, making it harder to determine the effects of removing the overt camera. It also should be noted that the calculation of absolute change in average performance shows that one posture (participant A3's neck) *improved* once the camera was removed during the Observations + No Overt Camera phase. However, visual inspection of the graph shows that the trend of his neck performance was increasing throughout the Observations + Overt Camera phase and then began to *decrease* during the Observations + No Overt Camera

phase, indicating that this posture may have also been negatively impacted by the removal of the camera.

Overall, the results for Group A provide support for the notion that the observer effect may be more robust when observers are aware that their performance is also being observed and evaluated. Group A's responses to the exit interview questions also appear to suggest that their reactivity to being observed may have played a role in the observer effect. During the exit interview, all participants in group A reported that they thought about their performance of safe postures more often during the Observations + Overt Camera condition than they did in the Observations + No Overt Camera condition. Participants A2 and A3 also reported that they tried to improve their safe postures during both observation conditions, but tried harder to improve during the Observations + Overt Camera condition. Participant A1 said she *only* tried to improve her safe postures during the Observations + Overt Camera condition. When asked why these differences occurred across the two conditions, they reported that they wanted to do well in the Observations + Overt Camera condition because they thought their performance was going to be scored by someone.

When asked whether observing and scoring other people's safety performance is a reasonable intervention for improving the observer's safety performance, participant A2 said yes, because it helps the observers learn proper techniques and common mistakes. Conducting observations may have helped her

learn how to improve her own posture; however, she still reported that she thought about her safety performance more often and tried harder to improve it when she thought that someone was observing and scoring her safety performance.

Participants were asked if they simply *thought* about their safety performance more often as a result of conducting observations because previous studies have found that conducting observations causes observers to generate covert self-evaluative statements about their performance of the behavior they're observing (e.g., Alvero & Austin, 2006; Sasson & Austin, 2005).

These results provide some support for the idea that conducting observations may result in changes in the observer's covert verbal behaviors (e.g., thinking about the task more often, self-monitoring one's performance of the task, etc.), but might not always result in changes in his or her actual performance of the task. Participants who generated covert verbal behavior in the previous observer effect studies (e.g., Alvero & Austin, 2006; Sasson & Austin, 2005) were aware that their performance of the task was being observed. In these studies, the participants *did* demonstrate observer effects. In the current study, stronger observer effects were seen during the conditions in which participants believed their performance was being evaluated. These results (from the previous studies and the current study) indicate that changes in the observer's actual performance of the task may be more likely to occur when motivation variables associated with reactivity to being observed are present.

As discussed earlier, if the observers believe that their performance of the task is also going to be evaluated, then the act of observing and evaluating others may function as an Establishing Operation (EO) (Michael, 1982) for reinforcement for improving their own performance of that task (and/or punishment for *not* improving their own performance of that task). Participant A3's response to the last exit interview question might indicate this. He explained that if the observers are scoring other people's performance to try and help them improve, it will make the observers want to improve their own performance so that they do not feel like a hypocrite.

This might suggest that conducting observations functioned as EO for punishment and negative reinforcement for him. In other words, the aversive consequences he thought he might experience for not improving his safety performance (e.g., socially mediated consequences, such as receiving a bad score or receiving corrective feedback) might have become even more aversive once he began trying to help others improve their safety (by observing and scoring their performance). Thus, this produced a behavioral altering effect: improving his performance of the task that he is helping others improve. However, his performance was lower during the Observations + No Overt Camera phase, indicating that the EO might not have been as strong in this condition. The EO might not have been as strong in this condition because he was less likely to



experience the aversive, socially mediated consequences when he believed his performance was *not* going to be scored.

Results from group A also suggest that the observer effect may be more robust for behaviors that participants already have a history with trying to improve. Participant A2 said she mainly focused on improving her back posture, and did so throughout the study, because she had a history of lower back pain and receiving corrective feedback for poor back posture. When examined from a behavioral perspective, it is not surprising that she thought more about her back posture. The behavioral account of rule-governed behavior suggests that people covertly tact (i.e., say to themselves) and often follow rules that they have self-generated or have been told because tacting and rule-following has been reinforced by their verbal community from a young age (Fryling, Johnston, & Hayes, 2011).

At first, behaving in accordance with a rule may be reinforced only through socially mediated consequences (e.g., social approval from another person). This is especially likely when an individual follows a rule that he or she did not learn through trial and error (i.e., directly experiencing the consequences that the rule specifies). Over time, behaving in accordance with a rule can become automatically reinforcing, sustaining even in the absence of socially mediated reinforcement for that behavior. This can happen if the individual eventually comes into contact with the consequences that the rule specifies (e.g., notices less body pain as a result of maintaining certain postures) and/or because following rules in general continues to

result in more reinforcement than not following rules for that individual. It is possible that recognizing improvements in her own back posture was automatically reinforcing to participant A2, given her history with this behavior. It may have also been easier for her to simply recognize improvements in her back posture, since she had received feedback on her performance of this posture in the past.

**Group B.** Participants in Group B experienced the experimental phases in the following order: A (baseline), C (Observations + No Overt Camera), B (Observations + Overt Camera). Therefore, when these participants began conducting observations after baseline, they were told that they were “data collectors” in the study, meaning that they would simply be observing and scoring participants’ safe postures and microbreaks. No noticeable camera was placed near them while they worked on the typing task. In the last phase, they were told that their role had been changed to a participant, meaning that they would still observe participants’ safety performance, but that their safe postures and microbreaks would also be videotaped and scored. The noticeable camera was then placed near them while they worked on the typing task.

Conducting observations of others’ safety performance appeared to produce some improvements in only two (participant B2 and B3) of the three participants’ overall safe posture performance in Group B. As with group A, the greatest improvements were observed in the reactivity condition (C: Observations + Overt Camera) when both observation phases are compared to baseline. Table 2 lists the

absolute change in average performance for combined, neck, back/shoulder, foot, and elbow postures from Baseline to Observations + Overt Camera, Baseline to Observations + No Overt Camera, and Observations + No Overt Camera to Observations + Overt Camera for participants in Group B. Absolute percentage point increase in average combined safe posture performance from baseline to the Observations + No Overt Camera phase was 0% for participant B1, 7% for participant B2, and 13% for participant B3. Visual analysis of the graphs shows an increase in level and a slight increase in overall trend in participant B2 and B3's combined safe posture performance once the Observations + No Overt Camera phase was introduced after baseline. Participant B1's level of performance did not change from baseline to the Observations + No Overt Camera phase.

As observed with Group A, improvements in Group B's performance from baseline to the Observation + Overt Camera phase (the last phase for Group B) were larger than those observed in the Observation + Overt Camera phase. Absolute percentage point increase in average combined safe posture performance from baseline to the Observations + Overt Camera phase was 6% for participant B1, 14% for participant B2, and 37% for participant B3. Visual inspection of the data shows that participant B3's level of performance during the Observations + Overt Camera phase was higher than his levels of performance during baseline and the Observations + No Overt Camera phase. Participant B2's level of performance during the Observations + Overt Camera phase remained the same as her level of

performance during the Observations + No Overt Camera phase, but then increased during her last session. Participant B1's level of performance during the Observations + Overt Camera phase remained the same as his levels of performance during baseline and the Observations + No Overt Camera phase until the end of the phase; his level of performance was higher during his last 3 sessions, but was on a decreasing trend.

When considered across the three participants in Group B, 12 postures were exposed to the observation phases. Conducting observations with no overt camera present produced substantial improvements in 2 of the 12 postures, defined as a mean percentage point increase of 30% or more from baseline to the Observation + No Overt Camera phase. These include participant B2's elbow posture and participant B3's back/shoulder posture. Improvements in average performance of 10% or more were also noted for participant B1's foot posture. Caution is encouraged when interpreting some of these average percent increase calculations. Close inspection of the graphs reveal high variability in participant B1's foot posture in the Observation + No Overt Camera phase, making this improvement less convincing from a visual analysis perspective.

When the overt camera was added during the Observations + Overt Camera phase, 2 of the 12 postures yielded substantial improvements, defined as a mean percentage point increase of 30% or more from the Observations + No Overt Camera phase to the Observations + Overt Camera phase. These include participant

A3's back/shoulder and foot positions. Improvements in average performance of 10% or more were also noted for participant B1's back/shoulder position and participant B2's neck and foot positions. Caution is also encouraged when interpreting some of these calculations. Visual inspection of the graphs shows that participant B1's level of performance for back/shoulder posture increased more dramatically when the overt camera was added, but was on a decreasing trend towards the end of the phase. Participant B2's level of performance for neck position only increased slightly when the camera was added, and then increased more dramatically during her last session in that phase.

The order of the observations phases (i.e., Observations + No Overt Camera and Observations + Overt Camera) was counterbalanced across groups of participants to examine whether sequence effects were present. Since Group A demonstrated the greatest improvements during the Observations + Overt Camera condition (Group A's *first* observation phase), it was expected that the greatest improvements in Group B's performance would be seen during the same condition (Group B's *second* observation phase). However, visual inspection of the combined safe posture data for two of the three participants in Group B (B1 and B2) shows that their performance during both observation phases was similar.

The different outcomes between Group A and the two participants in Group B might indicate that sequence effects impacted the results. In other words, they might indicate that the Observations + Overt Camera condition produces larger

observer effects than the Observations + No Overt Camera, but only if observers experience the Observations + Overt Camera phase first. If sequences effects truly are responsible for these differences, then the results might suggest that observers who have been conducting behavioral observations of others without having their performance evaluated might not demonstrate stronger observer effects if they are later told that their performance is going to start being evaluated, too. Any observer effects that they have experienced from simply conducting behavioral observations might remain the same; reactivity to being told that their performance is going to start being evaluated would not improve their performance much further. On the other hand, if the observers are told at the moment they are first asked to conduct behavioral observations that their performance is also going to be evaluated, they might demonstrate stronger observer effects than they would have if they had *not* been told that their performance was also going to be evaluated.

It is difficult to determine whether these differences were due to sequence effects, because the combined safe posture performance of one of the three participants in Group B (B3) *did* demonstrate results that were similar to those seen in Group A; greater improvements were seen in the Observations + Overt Camera phase than in the Observations + No Overt Camera phase, even though he experienced the overt camera phase last. Additionally, some of the individual posture data from participants in Group B are similar to the results from Group A. Participant B1's back/shoulder, participant B2's foot posture, and participant B3's

back/shoulder and foot posture suggest that the Observation + Overt Camera phase did produce stronger observer effects for these individual postures. Finally, visual inspection of participant B1's combined safe posture performance shows that it remained the same throughout all three phases. Therefore, his performance did not appear to be impacted by conducting observations, regardless of the overt camera.

It is possible that reasons other than sequence effects were responsible for some of the differences observed between Group A and the two participants in Group B. Results from the exit interview may provide some insight. When asked if he tried to improve his safe postures at all during the study, participant B1 reported that he only tried to improve some when he noticed he wasn't doing them correctly, particularly his feet and elbows. He explained that these were his only postures that he believed could use improvement. Visual inspection of the data show that his elbow posture performance was already near an average of 100% during baseline, and then remained at 100% throughout most of the sessions in the Observation + No Overt Camera phase and all of the sessions throughout the Observation + Overt Camera phase. Some improvement was also observed in his foot position during the Observation + No Overt Camera phase and the beginning of the Observation + Overt Camera phase, but his performance was highly variable and decreased back to 0% during his last 3 sessions.

It is interesting that he did not report trying to improve his back posture. Visual analysis of the data for his back posture show improvements during the

Observations + Overt Camera phase. However, he reported that he never thought he was slouching, which suggests that he was probably thinking about his back posture. Simply thinking more about his back posture during the Observations + Overt Camera phase may have resulted in an improvement in it. He may have reported that he didn't try to correct it because he did not notice that he was doing anything differently.

This would not be surprising, since participants never received feedback on their posture performance. Previous observer effect studies have found that conducting observations of others combined with receiving performance feedback produces stronger improvements in the observer's performance when compared to observations or feedback alone (e.g., Nielsen, Sigurdsson, & Austin, 2009). Sigurdsson and Austin (2008) explain that feedback may further improve performance because it allows participants to discriminate between the kinesthetic stimuli associated with safe and unsafe performance (as cited in Nielson, Sigurdsson, & Austin, 2009). Inaccurate discrimination between the kinesthetic stimuli may have caused participants to inaccurately evaluate their performance, which may be why some participants, including B1 in this case, reported that they did not improve some postures that actually did show improvements. This also may explain the high variability in some of the data for postures that showed improvements.



Participant B1 also reported that he thought it was best to do what was most comfortable to him. All participants were asked at the beginning of the study whether they had any problems related to body pain or discomfort. Although he reported he did not, it is possible that he experienced discomfort when he tried to maintain a correct posture during the study. His baseline performance for every posture except for elbow was below an average of 30%, indicating that he did not naturally sit in positions that gave him proper foot, back/shoulder, and neck posture while working at a computer. Thus, it is possible he experienced some discomfort when he was trying to improve, or simply noticing that these positions felt “unnatural” was aversive to him, causing him to stop trying to change his performance. This is similar to speculations about why participant A2 focused more on improving her back posture. In her case, automatic reinforcing consequences for maintaining proper back posture might have made the observer effect more robust for her correct performance of this posture, whereas automatic punishing consequences for maintaining proper postures may have weakened the observer effect for participant B1’s correct performance of certain postures.

Participant B2 reported that she sometimes tried to correct her posture *while* she was watching and scoring the videos. Although she wasn’t told this, she may have believed that her postures were going to be observed and scored while she was watching and scoring the videos (rather than, or in addition to, while she was later doing the coding task). She also reported that she only tried to improve her feet

because she wanted to see if it improved her productivity on the coding task and because she thought all of her other postures were fine. Visual analysis of the data show that her foot posture did appear to improve during the Observations + No Overt Camera phase and further during the Observations + Overt Camera phase, although it was highly variable. She also believed that the study was about examining how safe postures impact typing productivity. She reported trying to improve her feet to see how it affected her productivity. It is possible that she only continued trying to improve a posture if she noticed it was correlated to improved productivity in her typing performance.

During the exit interview, participant B2 also reported that when the overt camera was added, she did not think about her performance more often or try harder to improve her safe postures than she did in the Observation + No Overt Camera phase. She mentioned that shortly after the camera was turned on, she would forget about it because she was so focused on entering the data for the coding task. Although the participants were reminded about the camera at the beginning of every session, the camera was placed off to the side, out of the participants' view. This was done to convince the participants that the camera was capturing all of their targeted body postures so that someone could score them. It is possible that improvements would have been more robust for her if the camera was placed within her view while she worked on the coding task.

B3's responses to the exit interview questions do not correspond to his performance. He reported that watching and scoring the videos did not make him think about his safety performance while he watched and scored the videos, and did not make him think about his safety performance more often while he worked on the coding task. Additionally, he mentioned that the presence of the overt camera also did not make him start thinking about his safety performance more often than he did before.

### **Microbreak Performance**

Microbreaks were not impacted by conducting observations alone and combined with the overt camera for any participant in the study. Results from the exit interview might provide some insight into why microbreaks did not occur for some of the participants. All participants commented on their microbreak performance except for participant B3. When asked during the exit interview if they tried to improve their safety performance at all during the study, participants A1 and A2 both said that they didn't want to take microbreaks because they thought it would disrupt their performance on the coding task. They reported thinking that their productivity on the coding task was important to the study, so they did not want to disrupt their performance. Participants A3 and B1 also both reported that they did not try to improve their microbreaks. Participant A3 stated that he felt he did not need to take breaks, but he still tried to improve his posture because he thought that his posture needed improvement. Participant B1 only reported that he

figured it was best to do what was most comfortable to him, indicating he did not feel that he needed breaks either.

Participant B2 reported during the exit interview that she *did* try to improve her microbreaks, but only during the Observations + Overt Camera condition, since she thought someone was going to score her performance. Data were also collected on the number of seated stretches participants performed during each coding task session. Although she never performed a correct microbreak (stretching while *standing up*) she did begin performing stretches while sitting in her chair. Participant B2's data show that she did not take any seated stretch breaks during baseline or the Observations + No Overt Camera condition. During the Observations + Overt Camera condition, she took one seated stretch break during her 2<sup>nd</sup> and 3<sup>rd</sup> session (i.e., her 16<sup>th</sup> and 17<sup>th</sup> session in the study), and two seated stretch breaks during her 4<sup>th</sup> session (i.e., her 18<sup>th</sup> session in the study). She reported that she believed her productivity on the coding task was important to the study. Therefore, like some of the other participants, she may not have stood up to take a break because she did not want to disrupt her performance on the coding task.

It is possible that the observer effect is a more effective intervention for *improving* behaviors that are already a component of the observers' behavior chain for completing the task they are asked to do. A behavior chain is defined as a sequence of responses that are functionally related to the same terminal reinforcer (Kuhn, Lerman, Vorndran, & Addison, 2006). The behaviors targeted in this study

were postures (i.e., body positions while sitting in a chair and typing on a computer) and microbreaks (i.e., taking a brief break from the computer task by standing up and stretching). These behaviors were targeted while participants worked on a coding task, which required participants to type information from a stack of datasheets into an excel spreadsheet on the computer. From a behavioral standpoint, one might describe the participants' performance of the coding task as a behavior chain, comprised of a set of behaviors that occur in a typical sequence to achieve some consequence. For example, to enter the data into the excel spreadsheet, one might sit down in the computer chair, open the excel spreadsheet, place one datasheet on a document holder while leaving the unfinished stack on the right side of the table, enter all of the information from the first datasheet into the excel spreadsheet, take the datasheet off the document holder and set it face down on the left side of the table, and then repeat the sequence.

Throughout this study, all participants sat down in the computer chair while they worked on the coding task, so working in a seated position was already part of their behavior chain for completing that task. Thus, before experiencing the observation conditions, their feet, elbows, necks, backs, and shoulders were already placed in some position while their bodies were in a seated position. In order to improve their performance of the postures targeted in this study, participants only had to change the *way* they performed a behavior that they were already performing during the coding task, rather than engage in a completely new behavior or disrupt

their behavior chain. In this study, correctly performing a microbreak required participants to stand up and stretch during the coding task. During baseline, some participants occasionally took breaks from the coding task to use their phone, but no participant stood up from their chair. Thus, standing up was not already part of their behavior chain to complete the coding task.

This may also help explain outcomes from previous observer effect studies that did not target ergonomic behavior. For example, in the study by King, Wilder, and Sigurdsson (2014), the observer effect impacted only 1 of 3 participants' performance of wearing gloves correctly while working with clients during therapy sessions. During baseline, two of the participants (Jean and Scarlet) rarely wore gloves at all while working with their clients, whereas the third participant (Emma) wore gloves more consistently (but incorrectly) while working with her clients. Results showed that Emma was the only one who improved her performance of wearing gloves correctly as a result of observing and evaluating others' glove-use performance. The observer effect may not have occurred for Jean and Scarlet because wearing gloves was not already part of their typical behavior chain during therapy sessions with their clients.

Overall, results from this study suggest that the observer effect, defined as an improvement in the observer's performance of a task after observing and evaluating others perform that task, might only occur under certain conditions. Previous studies that have demonstrated the observer effect examined it with

participants who were explicitly told or may have been led to believe that their performance was also being observed and evaluated (e.g., Alvero & Austin, 2004; Alvero, Rost, & Austin, 2008; Guercio & Dixon, 2011; Nielsen, Sigurdsson, & Austin, 2009; Sasson & Austin, 2005; Taylor & Alvero, 2012). The current study examined whether this reactivity to being observed plays a role in the observer effect by evaluating the observer effect during a condition in which reactivity to being observed was present and during a condition in which reactivity to being observed was minimized or absent.

Results showed that the reactivity condition typically yielded stronger observer effects. These outcomes suggest that the observer effect may be more likely to occur when the observers believe that their performance of the task will also be observed and evaluated. In our literature search of research on the observer effect, there were no other studies that manipulated reactivity across conditions to compare the observer effect with and without it. Thus, more research is still needed to clarify whether reactivity makes the observer effect more likely to occur.

### **Future Research**

Future research should examine whether greater differences in the observer effect are found between reactivity and non-reactivity conditions when examined with job-related behaviors in the participants' actual work setting. It is reasonable to believe that an applied study like this might yield stronger differences, given the participants' (presumed) history of reinforcement with stimuli and behaviors related

to their job. For example, in the current study, the presence of the overt camera and being told that their performance would be evaluated might have been a discriminative stimulus (SD) (Michael, 1982) for socially mediated reinforcement and/or punishment for the participants' safety performance. In other words, these stimuli may have signaled to the participants that the probability of getting feedback (or some socially mediated consequences) on their safety performance was higher in this condition, since it was being videotaped and scored by someone. It is also hypothesized that conducting observations of others functioned as an EO for socially mediated consequences related to the participants' safety performance, evoking better safety performance mainly in the Observations + Overt Camera condition (since these consequences would have been more valuable *and* more likely to occur in this condition).

Greater differences in the observer effect between reactivity and non-reactivity conditions might be found in an applied study because these stimuli (conducting observations and being told that their performance is being observed) might be more likely to have these effects (discriminative and evocative) for participants when they are in their work environment. This is because the participants would be in a setting where they presumably have a history of experiencing valuable, socially mediated consequences. For example, in the current study, conducting observations may not have been enough to alter the value of the type of consequences participants might have expected to experience in a research



study. However, if an employee were asked to observe and score his coworker's performance of a task that he should also be performing at work, then conducting observations may be more likely to alter the value of the consequences he would expect to experience for his performance in this setting.

Future research could examine this by conducting a study similar to the one by Howard, Burke, and Allen (2013), in which *supervisors* ask some of their employees to observe and score their coworkers' performance of a certain task that they (the observers) are also expected to perform at work. The study could target a task for which the employees have experienced feedback (or some work-related consequence) from the supervisor. Then, similar procedures from the current study could be used to see whether the employees participating in the study demonstrate stronger observer effects during reactivity conditions. In one condition, the supervisors could simply ask some of the employees to help them collect some performance data, without telling them that data on their performance of the task will also be collected. In another condition, the supervisors could ask the employees to help them collect some performance data, and notify them that data on their performance of the task will also be collected. These conditions can also be compared to a reactivity condition alone, in which the supervisors simply tell employees that their performance of the task is going to be observed and evaluated more often. This research could help further strengthen the validity of the observer effect as a useful intervention for improving employee performance, and clarify

whether reactivity plays a role in the observer effect when peer observations are used in the work environment.

The information gained from this applied research on the observer effect could be very useful to behavior analysts. Outcomes from these types of studies could clarify how to optimize the use of peer observations when they are used as a data collection method in BBS or other behavior analytic interventions. If the research on the observer effect in applied settings demonstrates that it's more likely to occur under conditions that cause reactivity, behavior analysts might more consistently include peer-to-peer feedback as a component of the peer observation process. This would be done to create conditions that cause reactivity among all employees so that they are more likely to experience the observer effect when they are conducting the observations.

Another suggestion for future research would be to further explore whether the sequence of observation and observation + reactivity conditions impact the observers' performance. The current study examined this by counterbalancing the order of phases across groups of participants. Thus, not every participant experienced both sequences. Future research could further examine the presence of sequence effects by exposing each participant to both sequences simultaneously, counterbalancing it across a set of behaviors.

Finally, future research could examine the observer effect as an intervention for microbreaks. or behaviors that are not already part of the observer's behavior

chain to complete the task. Some of the participants in this study reported that they did not want to do microbreaks because they believed their productivity on the typing task was important to the purpose of the study and that microbreaks would decrease their typing productivity. Future research could examine whether the observer effect would impact participants' performance of microbreaks during a typing task if they are asked to collect data on another person's performance of microbreaks *and* the impact those microbreaks are having on that person's typing productivity. Experimenters could use videos of confederates and fake typing productivity data so that they could manipulate what the participants are observing and scoring. The study could evaluate whether the observers are more likely to increase their use of microbreaks during a typing task if the data they collect from the observations (e.g., the confederate's score on microbreak performance and the confederate's score on typing productivity) demonstrate a link between increased microbreaks and improved typing productivity.

In conclusion, this study adds to the literature on the observer effect by providing information about its occurrence during reactivity and non-reactivity conditions. This was examined because previous research suggested that the observer's awareness might be an important factor in the observer effect, but it had not yet been evaluated. Results from this study suggest that the observer effect may be more likely to occur when the observer is aware that his or her own performance is also being evaluated. Future researchers are encouraged to further evaluate the

role of reactivity in the observer effect in order to clarify the behavioral mechanisms and the conditions that enhance its occurrence. This information would be valuable to OBM consultants and their clients because it would help them optimize the use of peer observation procedures and gain larger improvements in performance.

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Table 1

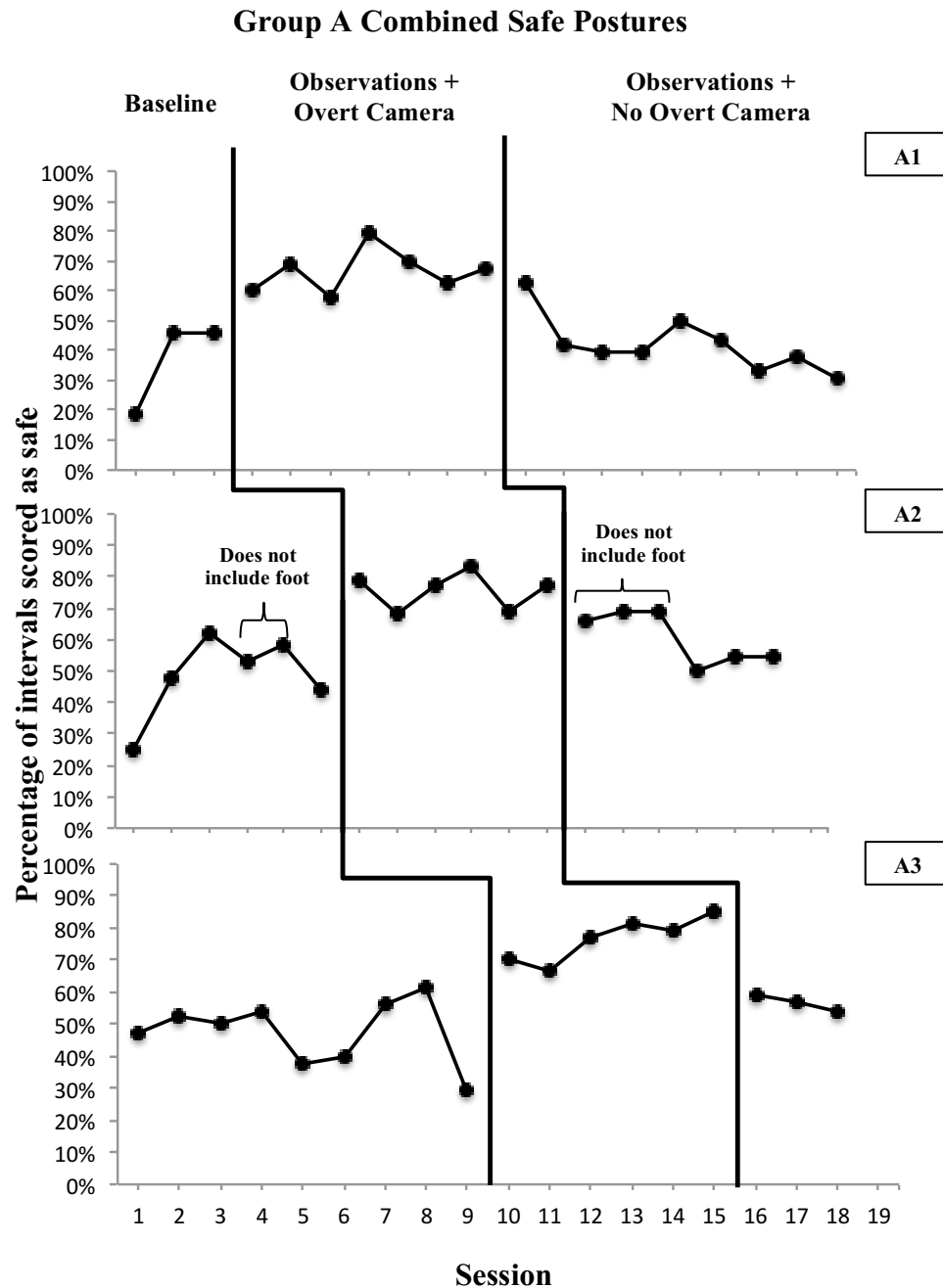
*Absolute changes in average combined, neck, back/shoulder, foot, and elbow posture performance from Baseline to Observations + Overt Camera, Baseline to Observations + No Overt Camera, and Observations + Overt Camera to Observations + No Overt Camera for participants in Group A.*

Participant	Posture	Absolute change in average performance from:		
		BL to Obs + Overt Cam	BL to Obs + No Cam	Obs + Overt Cam to Obs + No Cam
A1	Combined	30%	5%	-24%
	Neck	12%	-1%	-13%
	Back/Shoulder	60%	31%	-29%
	Foot	17%	-6%	-23%
	Elbow	30%	-1%	-31%
A2	Combined	27%	12%	-15%
	Neck	23%	0%	-23%
	Back/Shoulder	19%	19%	0%
	Foot	51%	-10%	-61%
	Elbow	28%	22%	-6%
A3	Combined	29%	9%	-20%
	Neck	19%	33%	14%
	Back/Shoulder	30%	30%	0%
	Foot	66%	-21%	-87%
	Elbow	1%	-5%	-6%

Table 2

*Absolute change in average combined, neck, back/shoulder, foot, and elbow posture performance from Baseline to Observations + Overt Camera, Baseline to Observations + No Overt Camera, and Observations + No Overt Camera to Observations + Overt Camera for participants in Group B.*

Participant	Posture	Absolute change in average performance from:		
		BL to Obs + Overt Cam	BL to Obs + No Cam	Obs + No Cam to Obs + Overt
B1	Combined	6%	0%	6%
	Neck	4%	3%	1%
	Back/Shoulder	15%	-7%	22%
	Foot	2%	13%	-11%
	Elbow	3%	-2%	4%
B2	Combined	14%	7%	6%
	Neck	10%	-1%	11%
	Back/Shoulder	6%	0%	6%
	Foot	-5%	-22%	17%
	Elbow	42%	52%	-10%
B3	Combined	37%	13%	24%
	Neck	5%	-2%	7%
	Back/Shoulder	81%	46%	35%
	Foot	48%	3%	45%
	Elbow	14%	6%	8%



*Figure 1.* The percentage of intervals scored as safe for all postures combined during baseline, the observations + overt camera condition, and the observations + no overt camera condition for participants in Group A.

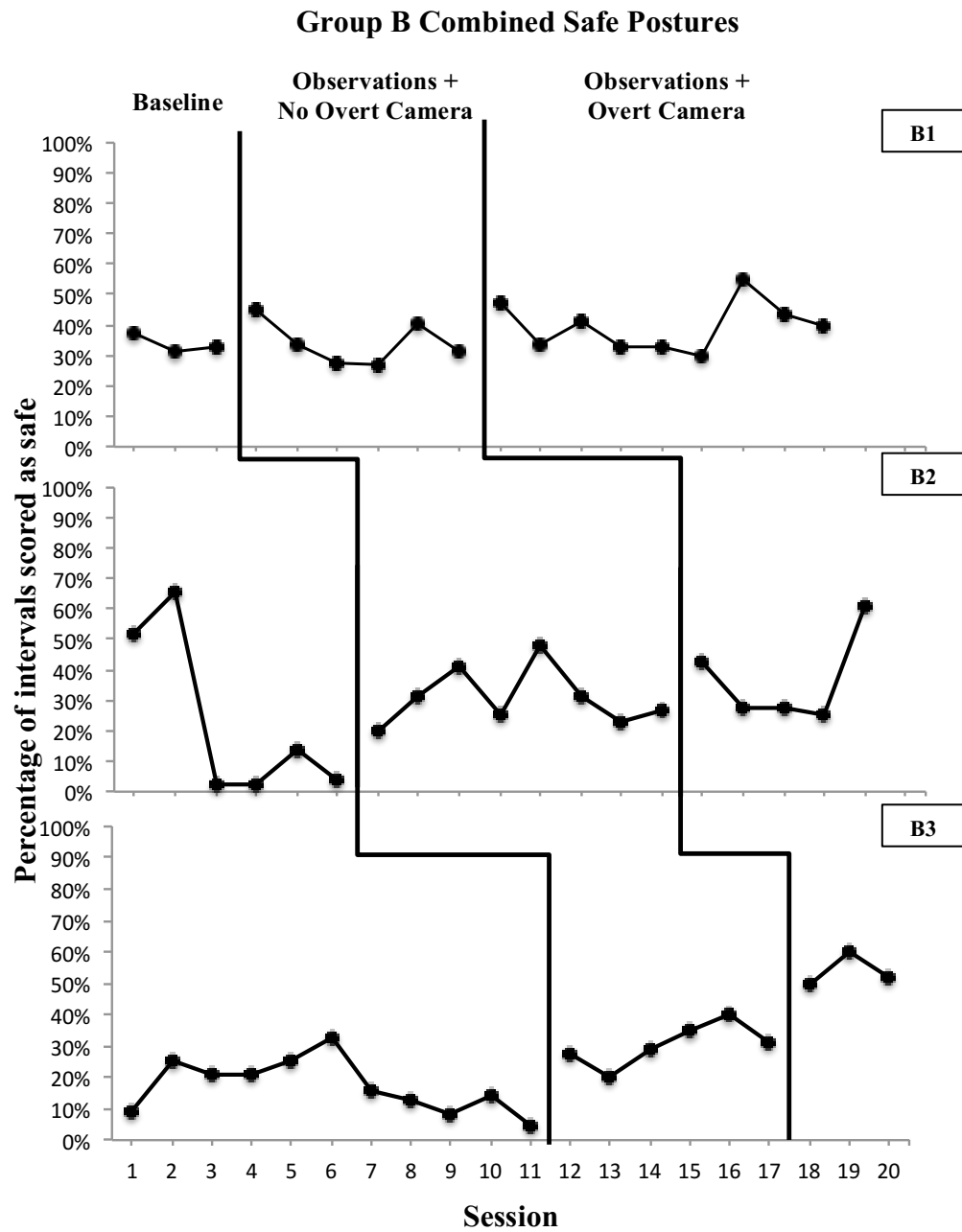
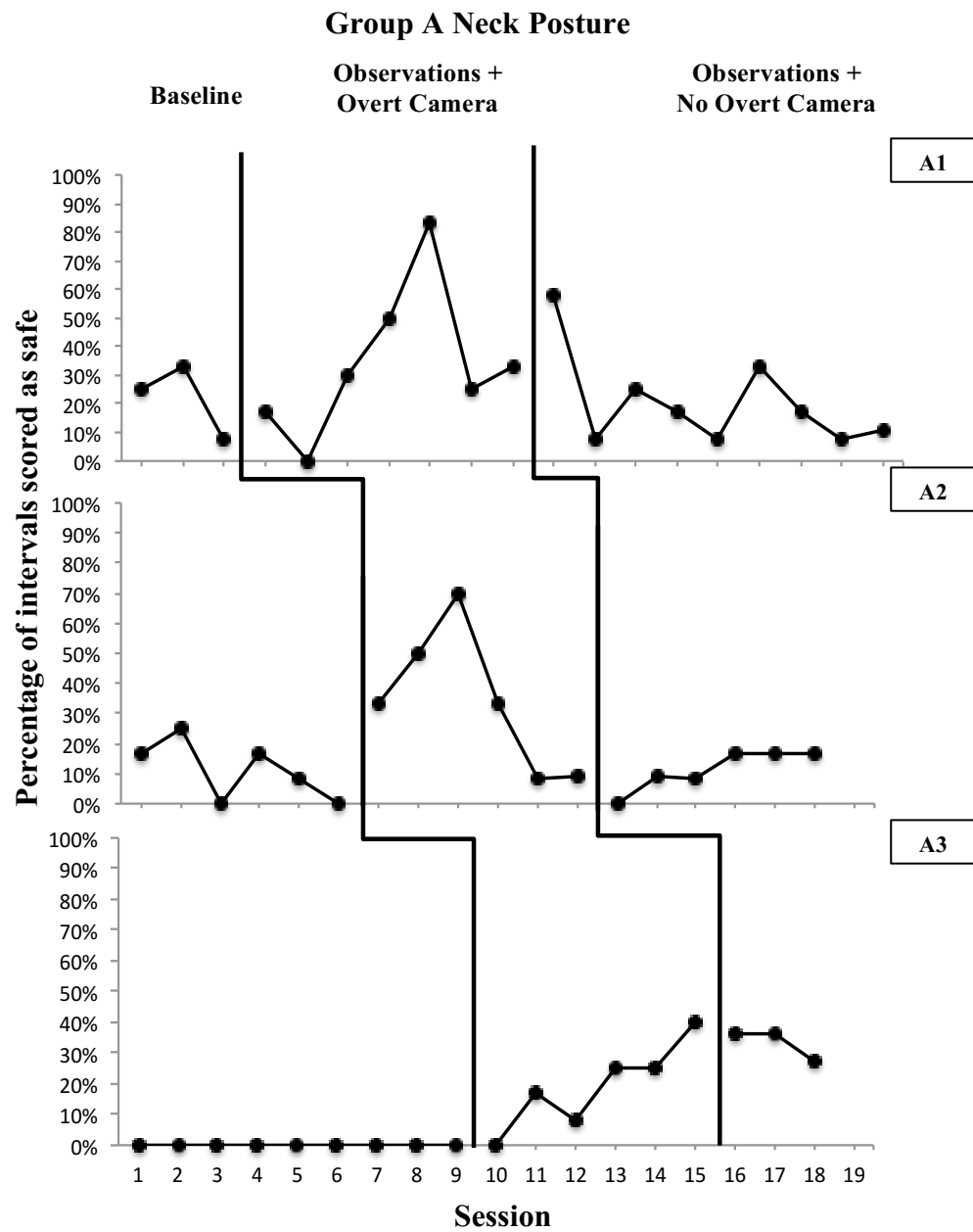
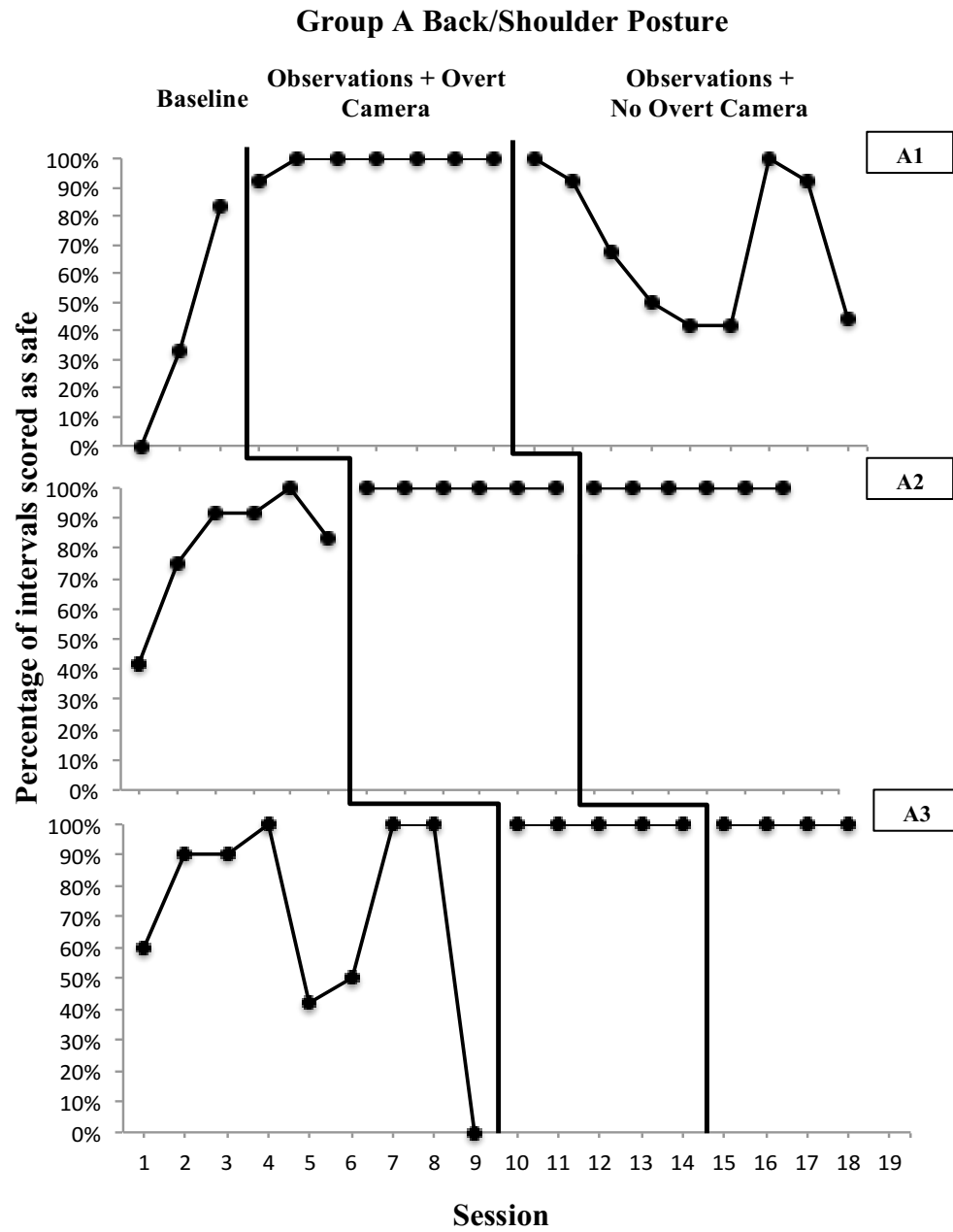


Figure 2. The percentage of intervals scored as safe for all postures combined during baseline, the observations + no overt camera condition, and the observations + overt camera condition for participants in Group B.

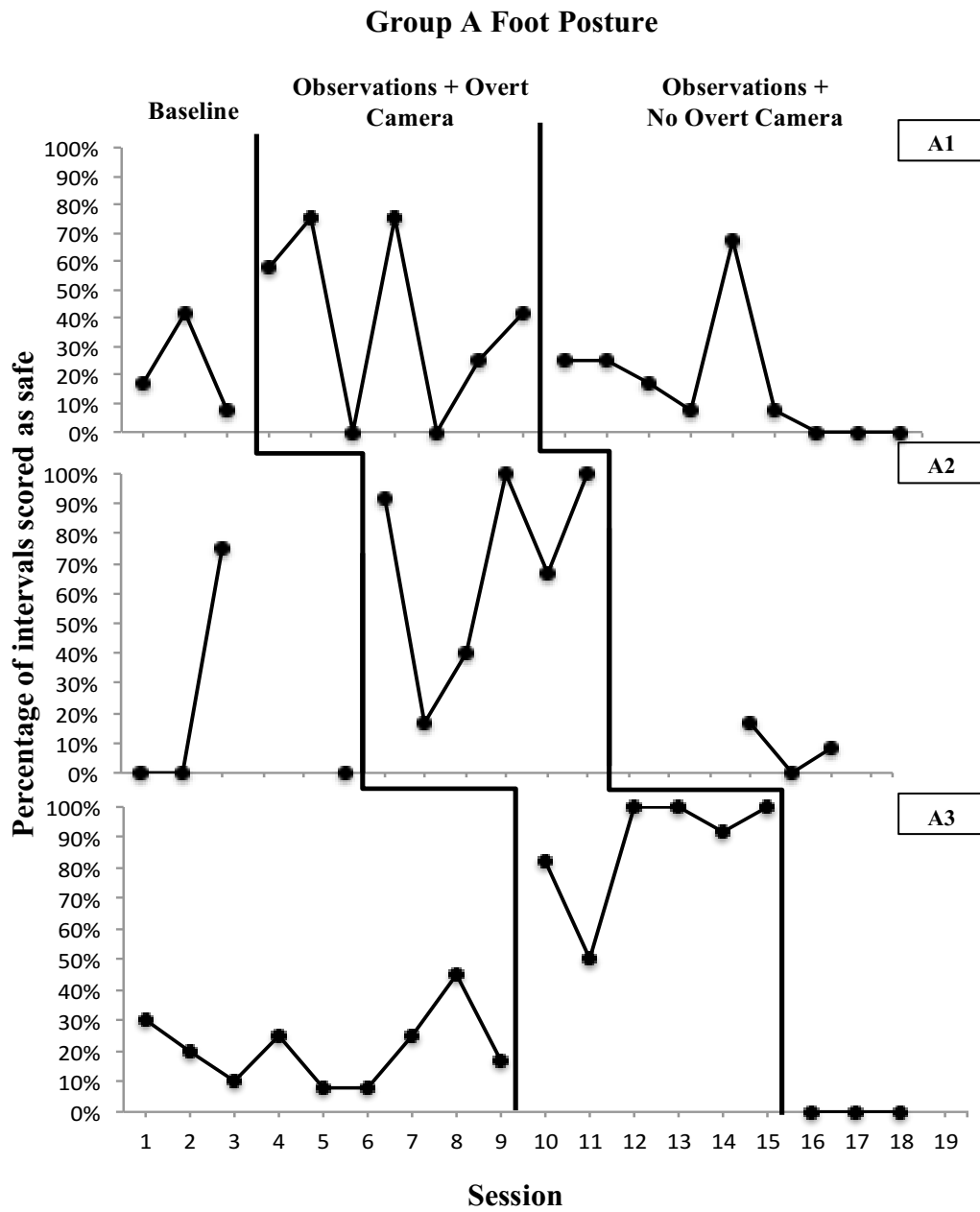


*Figure 3.* The percentage of intervals scored as safe for neck posture during baseline, the observations + overt camera condition, and the observations + no overt camera condition for participants in Group A.

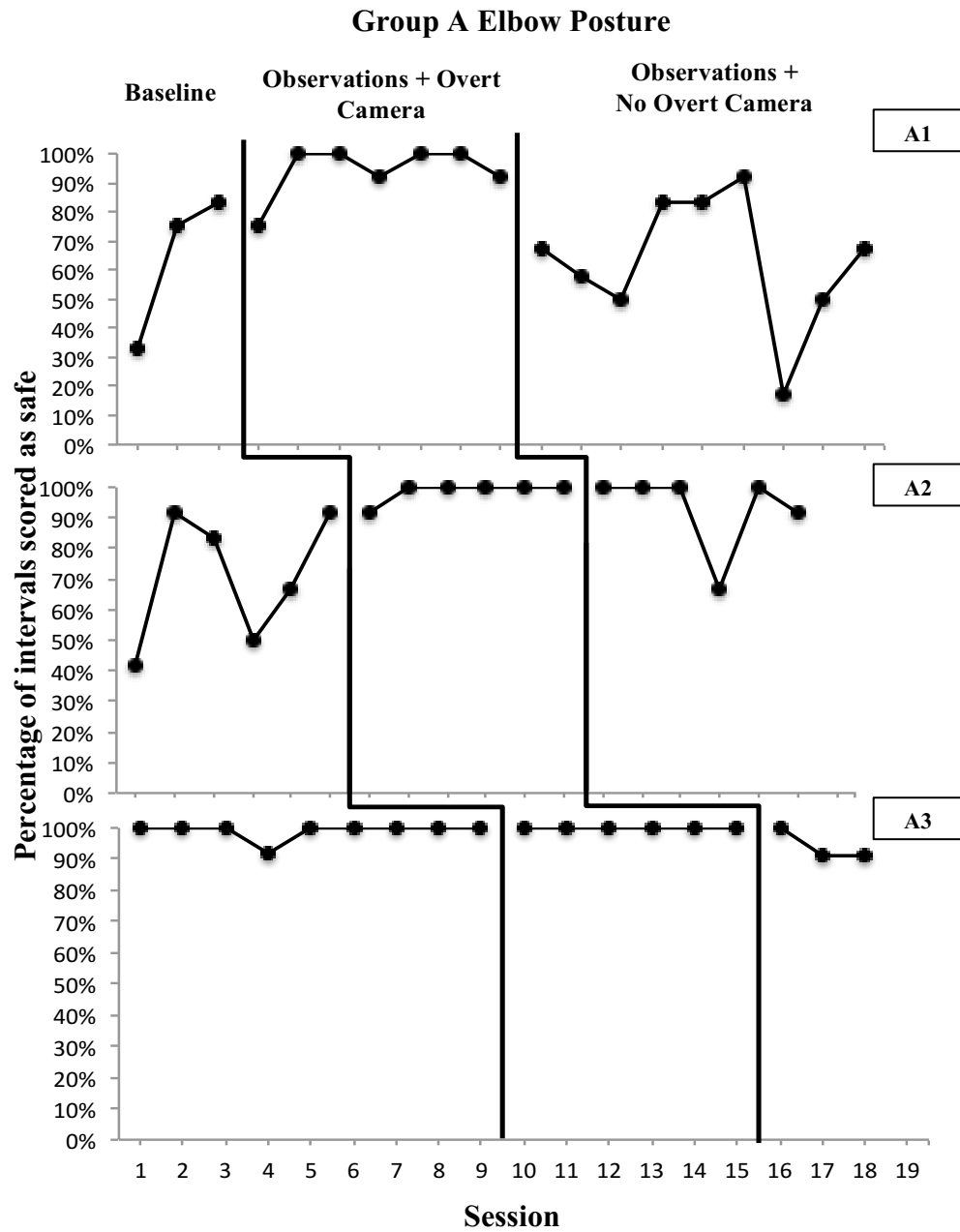


*Figure 4.* The percentage of intervals scored as safe for back/shoulder posture during baseline, the observations + overt camera condition, and the observations + no overt camera condition for participants in Group A.

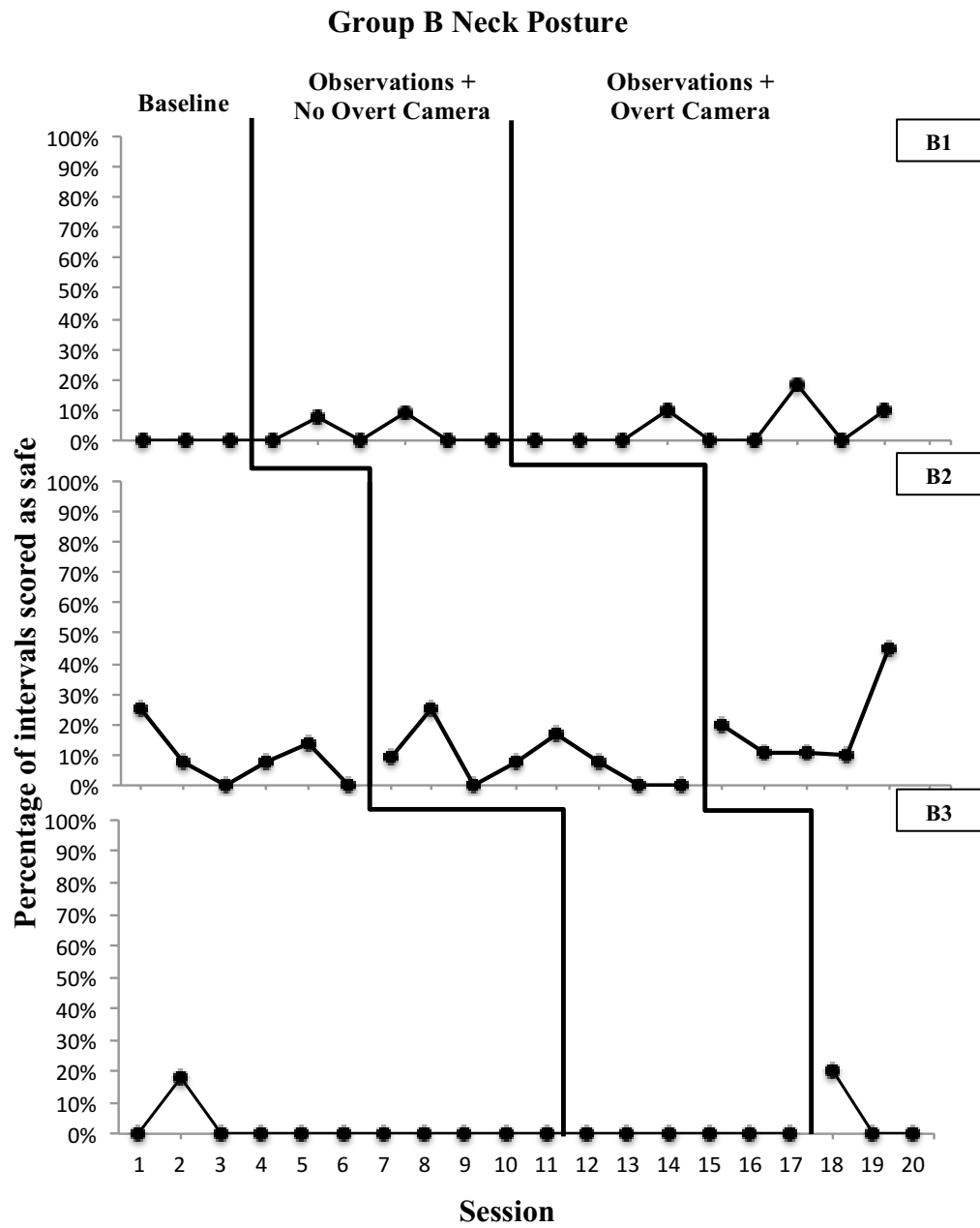




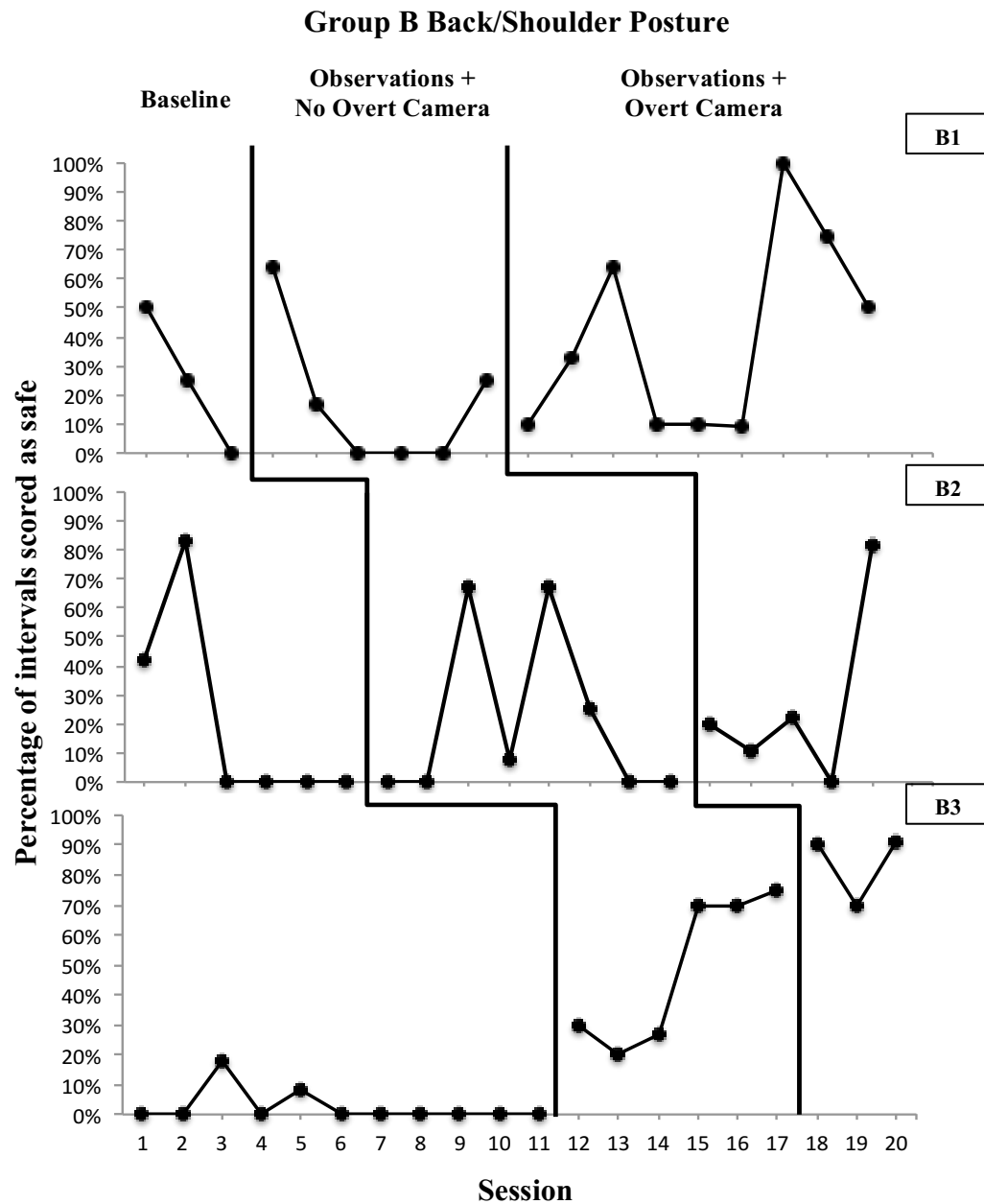
*Figure 5.* The percentage of intervals scored as safe for foot posture during baseline, the observations + overt camera condition, and the observations + no overt camera condition for participants in Group A.



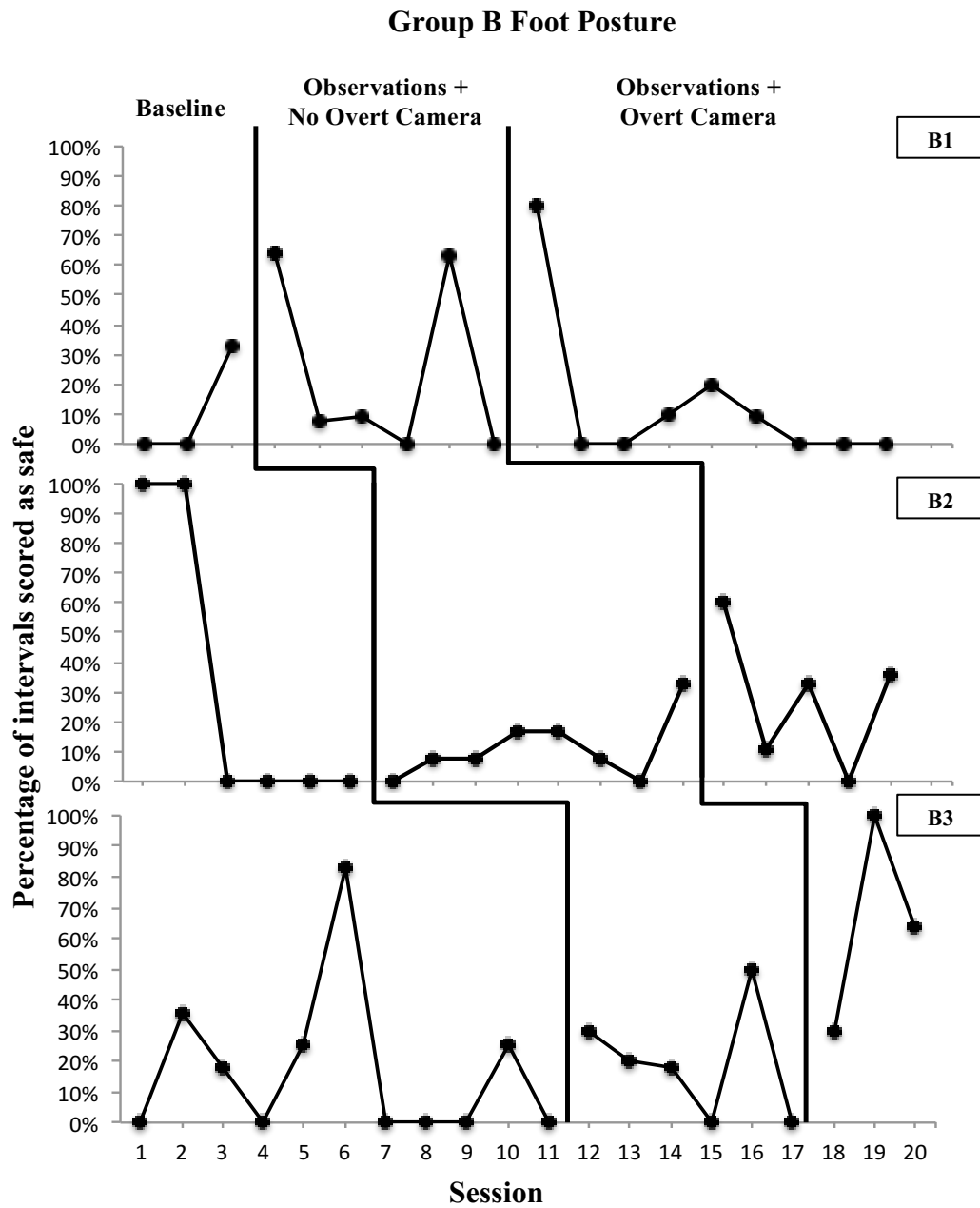
*Figure 6.* The percentage of intervals scored as safe for elbow posture during baseline, the observations + overt camera condition, and the observations + no overt camera condition for participants in Group A.



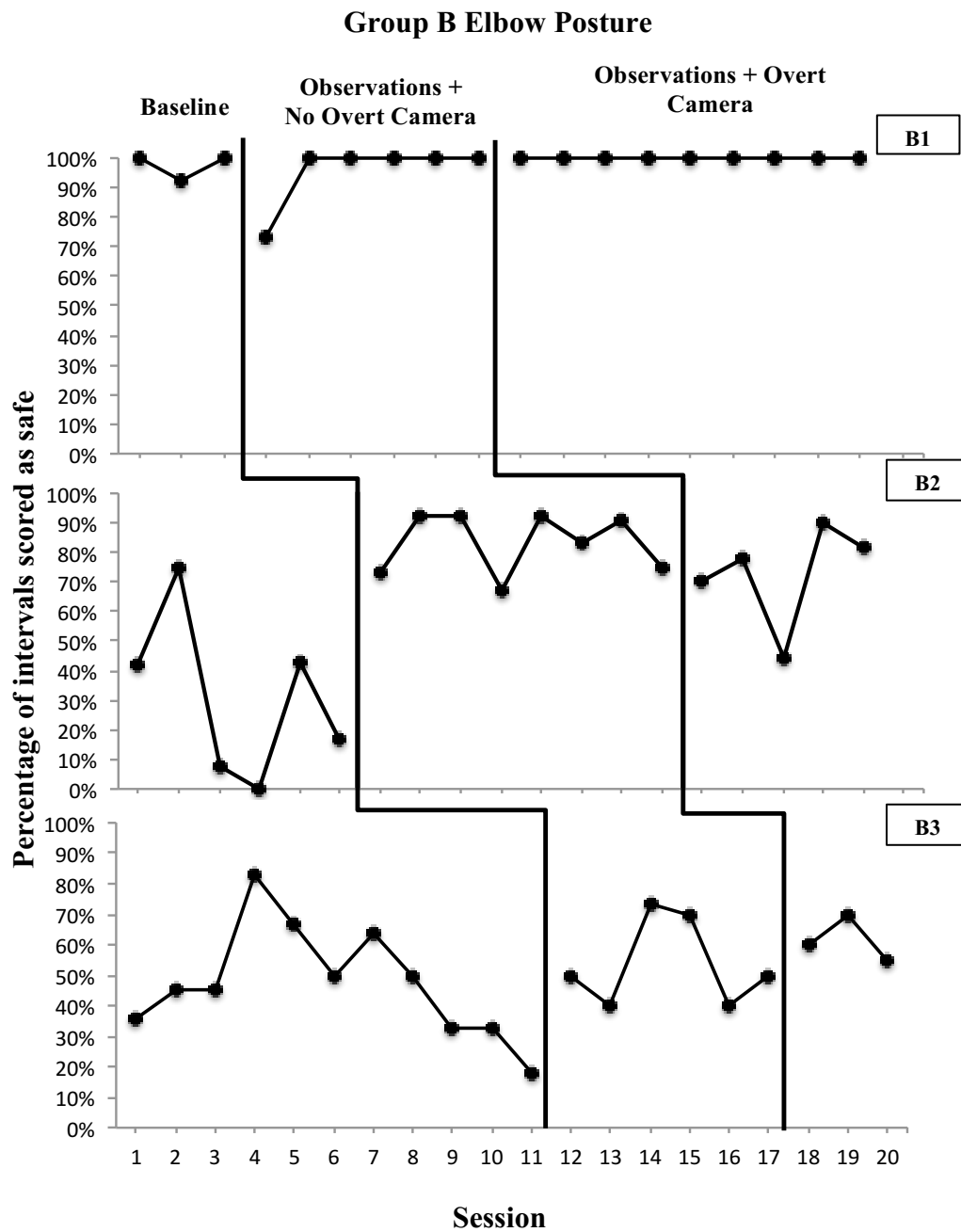
*Figure 7.* The percentage of intervals scored as safe for neck posture during baseline, the observations + no overt camera condition, and the observations + overt camera condition for participants in Group B.



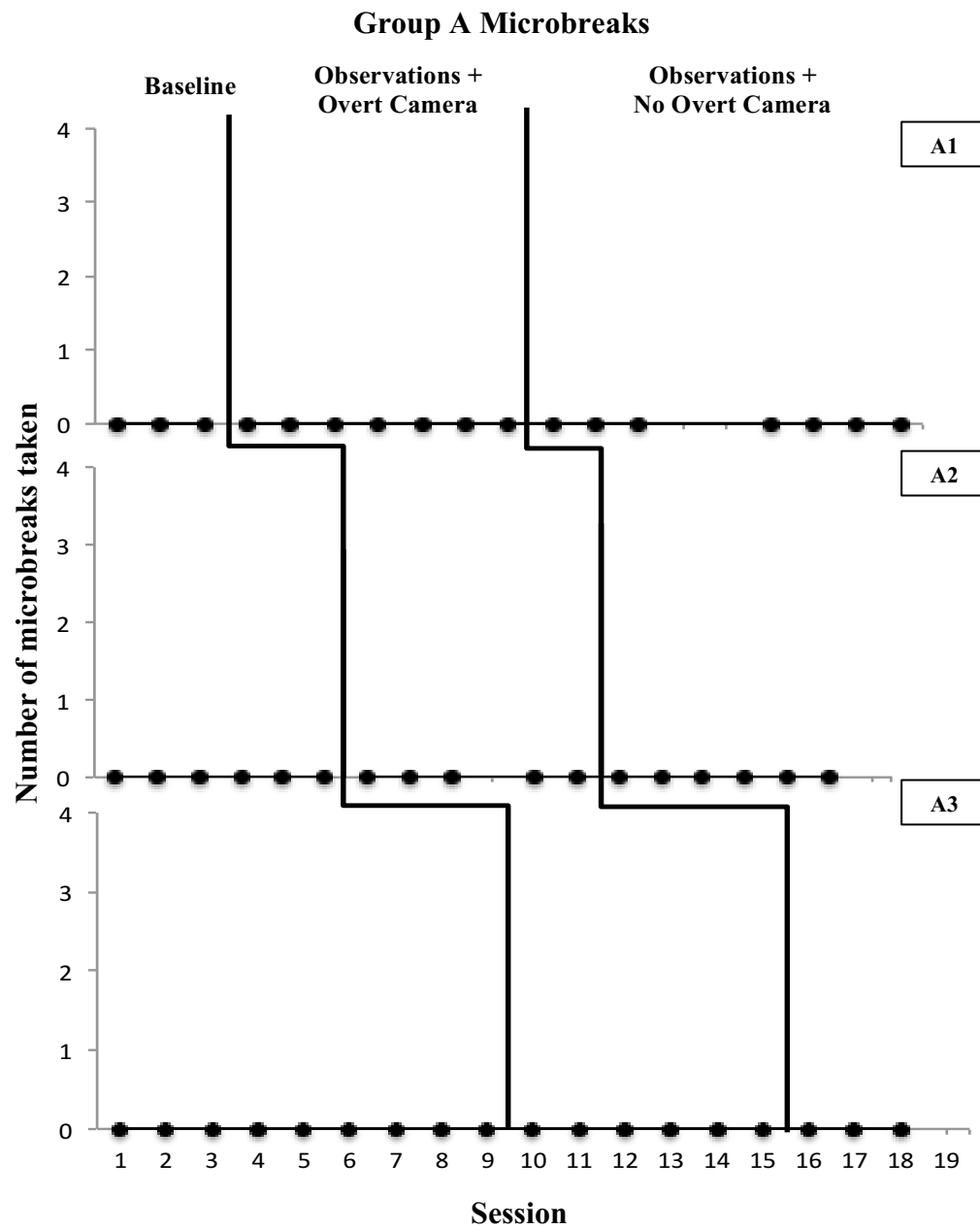
*Figure 8.* The percentage of intervals scored as safe for back/shoulder posture during baseline, the observations + no overt camera condition, and the observations + overt camera condition for participants in Group B.



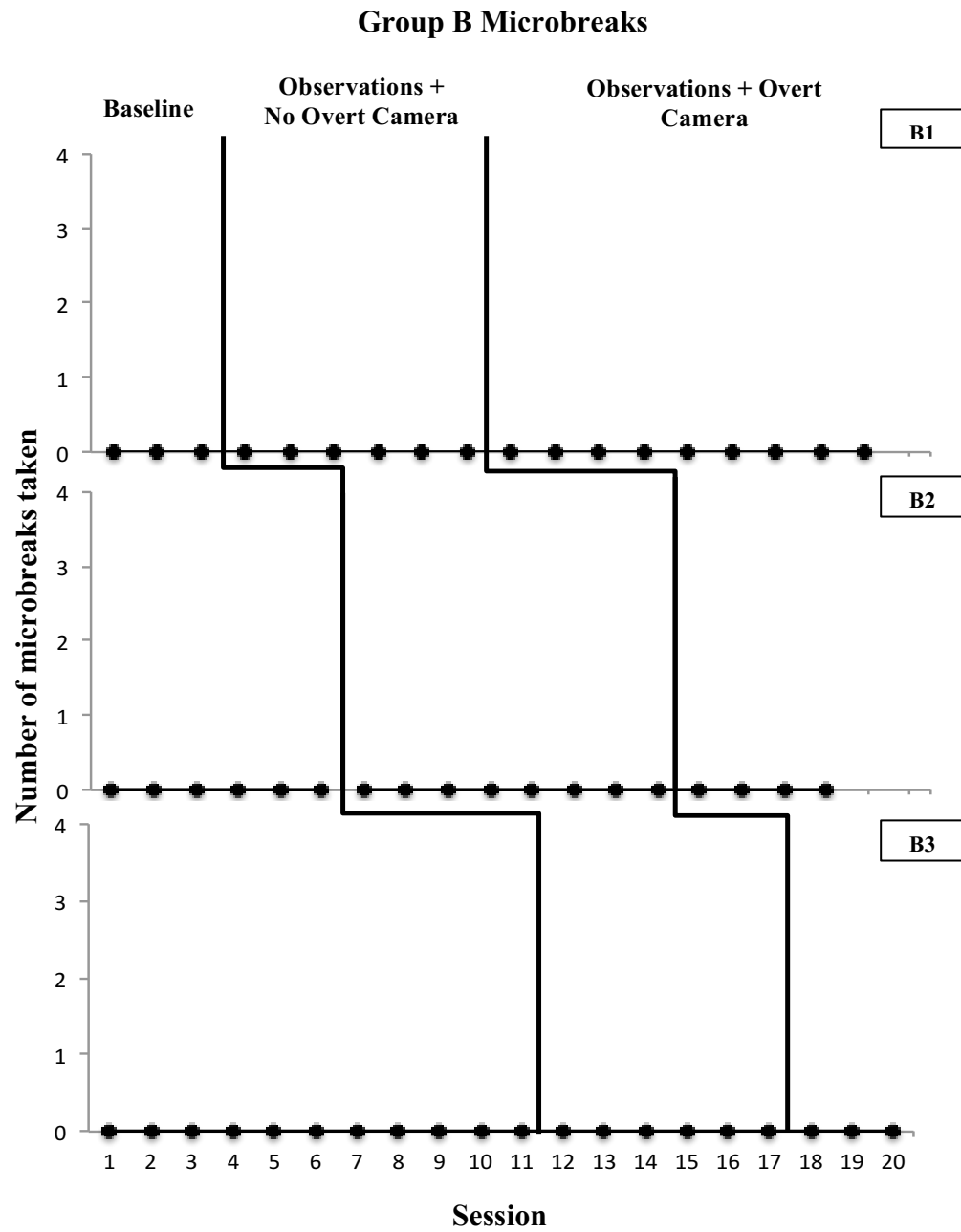
*Figure 9.* The percentage of intervals scored as safe for foot posture during baseline, the observations + no overt camera condition, and the observations + overt camera condition for participants in Group B.



*Figure 10.* The percentage of intervals scored as safe for elbow posture during baseline, the observations + no overt camera condition, and the observations + overt camera condition for participants in Group B.



*Figure 11.* The number of microbreaks taken during baseline, the observations + overt camera condition, and the observations + no overt camera condition for participants in Group A.



*Figure 12.* The number of microbreaks taken during baseline, the observations + no overt camera condition, and the observations + overt camera condition for participants in Group B.



## **Appendix A**

### **Recruitment Script**

*To be read aloud by the student investigator at undergraduate classes.*

“Hi, my name is Allison King and I am graduate student at FIT conducting a research study about measuring work-related behaviors. I hope to recruit 6 individuals to participate in this study. All experimental sessions will be held in room 267 on the second floor of the Harris Commons building.

This study has multiple sessions, and you will earn research credit and \$8 per hour, plus a \$25 amazon gift card if you complete all sessions. Your first several sessions will be approximately 25 minutes each, and your last several sessions will be approximately 30-35 minutes each. You will be asked to attend about 18 sessions, and you may schedule sessions as often as three times per day with a brief break in between. For example, if you attended 3 back-to-back sessions each time you participated (about 1.5 hours total), you would only come in for the study about 6 times. You will also be paid for any time you spend in a session for training purposes.

During sessions, you will be asked to work on one or two tasks at a computer. One task involves inputting experimental data into an excel spreadsheet, and the other involves watching and scoring videos. Because the tasks in this study require you to sit and work at a computer, you cannot participate if you have a diagnosed musculoskeletal disorder (MSD), chronic body pain that you are seeking medical attention for, or any conditions that may prevent you from doing typical office work for a short period of time. You do not need to have advanced skills in using Excel.

If you are interested in participating, please e-mail me or sign up for your first session on SONA. Thank you for your time.”

## **Appendix B**

### **Informed Consent Script**

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

If you would like to participate in this study, you are required to give informed consent first. To do this, you must carefully read this consent form. If you have any questions concerning the information on the form, please feel free to ask them. Once you have read it, you may decide whether you would like to participate or not. If you choose to participate, you must sign the form. If you choose not to participate and do not sign the form, you will not be penalized.

#### **{Hand participant a consent form}**

Please read this and take as much time as you need. Let me know if you have any questions when you are finished. If you choose to participate, please sign one copy for my records and keep the other copy for your records.

## Appendix C

### Informed Consent Form

**Please read this consent document carefully before you decide to participate in this study. The researcher will answer any questions before you sign this form.**

#### **Study Title:**

Measuring Work-Related Performance in an Office Setting

#### **Purpose of the Study:**

You are invited to participate in a research study about measuring work-related performance in an office setting.

#### **Procedures:**

During all of your sessions, you will be asked to complete a coding task, which involves inputting experimental data from paper-and-pencil datasheets into an excel spreadsheet. You will perform this task at a computer station in a private room at the university. During some of your sessions, you might also be asked to complete a video task, which involves watching short video recordings of individuals performing a work task and scoring their performance. A researcher will briefly train you how to do each task during one or two of your sessions.

You will be asked to attend multiple experimental sessions. Each experimental session is approximately 25-30 minutes each (as shown on SONA), but you are allowed to sign up for three back-to-back sessions per day so that you do not have to come back as many times. **For example, if you participate in 3 back-to-back sessions each time you attend, you will spend about 1.5 hours participating each time you attend, and will only be asked to attend about 6 times.** Sessions can be scheduled any day from Monday through Sunday.

After your first several experimental sessions, you will be randomly assigned into either a “participant” or “data collector” role. You will receive more information about this when you are assigned your role. Your role might also change at some point throughout the study, but you will be notified ahead of time if it does. The role you are given will not change the amount of time you spend in the study. Please note that everything described in this consent form applies to both roles. The word *participant* will be used throughout the remainder of this form to refer to both roles.

At the conclusion of the study, you will be debriefed individually and will be given an exit interview. **PLEASE NOTE:** It is possible that a participant will be dismissed from the study early (after their first several sessions). If you are dismissed from the study early, you will be notified that you are being dismissed

after your first several sessions. You will still be debriefed about the study when the study is completed. You will also still receive the credits and money you earned for participating in the first several sessions.

**Potential Risks of Participating:**

The tasks you will complete should not expose you to any risks greater than those you experience from your daily activities. The tasks may cause some minor fatigue. To minimize this, you are allowed and encouraged to take breaks if you begin to feel tired or experience any physical discomfort. Additionally, you will not be allowed to sign up for more than 3 sessions in one day to prevent you from experiencing any additional fatigue. You cannot participate if you have a diagnosed musculoskeletal disorder (MSD), chronic body pain that you are seeking medical attention for, or any conditions that may prevent you from doing typical office work for a short period of time. Risks of participating may be greater if you have any of these conditions. Please let the experimenter know at this time if you do.

It is estimated that the study will take a total of approximately 9 hours to complete cumulatively. To address this concern, you will be able to schedule sessions on days and times that are convenient for you, and can schedule 3 back-to-back sessions in one day if you would like. Additionally, you can choose to withdraw from the study without being penalized if it takes too much of your time.

Experimental sessions might also be recorded. Therefore, those participating could feel uncomfortable about being recorded. Steps will be taken to minimize these risks. Names and identifying characteristics of all individuals participating will be kept private, data will be password protected, and only the lead researchers will have access to it. Additionally, all individuals participating (participants and data collectors) will be debriefed about the study individually when the study is completed. See Confidentiality section below for more information.

If any individual participating is exposed to any unforeseen risks, such as an accidental injury, appropriate emergency procedures will be taken. However, no compensation or additional treatment will be available except otherwise stated in this consent form.

**Potential Benefits of Participating:**

You will not receive any direct benefits from this study; however, you may learn how to collect data on work-related behaviors and may learn how to enter numerical data into excel more efficiently. Data gained from your participation in the study may benefit the general scientific community by providing information about measuring work-related behaviors.

**Compensation:**

You will earn \$8.00 per hour and research credits (according to Florida Institute of Technology's SONA guidelines) for your participation in this study. Additionally, those who complete the study will earn a bonus in the form of a \$25 Amazon gift card. The total number of hours you will spend in the study is estimated to be 9 hours. Your money earned will not be penalized or forfeited should you choose to withdrawal from the study. However, you will not receive the \$25 completion bonus.

**Confidentiality:**

Any information that may be collected from you or about your performance will remain confidential. Therefore, your name and any other identifying information will never be shared in any publications or presentations about the study. Group and individual data might appear in publications and presentations of this research. Therefore, an alias will be assigned to each person if his or her data are entered into a database, analyzed, published, or presented.

The student investigator will keep a list with the names of participating individuals and their corresponding aliases. Once the data are collected and analyzed, the list will be destroyed. Data gathered from the study will be kept in a locked electronic folder on the student investigator's hard drive for at least three years.

Allison King and Nicole Gravina are prepared to meet personally with any student who wishes to discuss this research project and answer questions about the way data may be or are presented. As mentioned above, any personal identifying information will be removed from the data used in any publications or presentations.

**Voluntary participation:**

Your participation in this study is completely voluntary. There is no penalty for not participating. You may also refuse to answer any of the questions we ask you. When the study is completed, the student investigator will answer any questions you have about the purpose and outcomes of the study and your participation in it.

**Right to withdraw from the study:**

You have the right to withdraw from the study at any time without consequence.

**Whom to contact if you have questions about the study:**

If you have any questions about this study you may call Allison King or Nicole Gravina.

**Whom to contact about your rights as a research participant in the study:**

Lisa Steelman, IRB Chairperson

**Agreement:**

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant: \_\_\_\_\_ Date: \_\_\_\_\_

Principal Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

**Please keep the attached copy of this form for your records.**

## **Appendix D**

### **Information Script**

*To be read aloud by the student investigator to all participants at the beginning of the information phase.*

During each session of this study, you will be working on a coding task at the computer that involves transferring behavioral observation data from completed datasheets to an excel spreadsheet. During today's session, a researcher will train you how to do the coding task. Once you are finished with the coding task training, you will receive a brief training via a Power Point video about safe postures and the use of microbreaks while working on a computer. First I will teach you how to do the coding task, and then you will watch the safety Powerpoint training. Once you are finished, we will schedule your first session of the coding task.

## Appendix E

### Role Assignment Script for Group A

*To be read aloud by the student investigator to Group A at the beginning of their first Observation phase (Observations + Overt Camera).*

You have been assigned as a **participant** in this study. This means that your safe postures and microbreaks will *also* be observed and scored by a data collector. I will set up a camera that will videotape your safe postures and microbreaks while you work on the coding task. \*Show the participant the camera and tripod\*. So, while you work on the coding task during your sessions, you should try your best to have safe postures and take microbreaks.

### Role Assignment Script for Group B

*To be read aloud by the student investigator to Group B at the beginning of their first Observation phase (Observations + No Overt Camera).*

You have been assigned as a **data collector** for this study. This just means that you will be collecting data on someone else's safe postures and microbreaks by watching and scoring the videos at the beginning of your sessions.



## Appendix F

### Role Reversal Script for Group A

*To be read aloud by the student investigator to Group A at the beginning of their 2<sup>nd</sup> Observation phase (Observations + No Overt Camera).*

Your role in the study has changed. I do not need any more participants for the study anymore; I just need data collectors. So, you are now a **data collector**. This means that you will still be collecting data on someone else's safe postures and microbreaks by watching and scoring the videos at the beginning of your sessions, but there will no longer be a camera recording your safety performance during the coding task. Nobody will be scoring your safety performance anymore.

### Role Reversal Script for Group B

*To be read aloud by the student investigator to Group B at the beginning of their 2<sup>nd</sup> observation phase (Observations + Overt Camera).*

Your role in the study has changed. I need more participants for the study, so you are now a **participant**. This means that your safe postures and microbreaks will *also* be observed and scored by a data collector. I will set up a camera that will videotape your safe postures and microbreaks while you work on the coding task. \*Show the participant the camera and tripod\*. So, while you work on the coding task during your sessions, you should try your best to have safe postures and take microbreaks.

## Appendix G

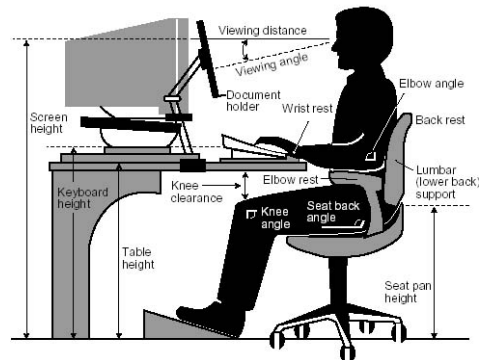
### Safety Handout

#### Safe Posture Guidelines

**Neck** – When sitting, the neck should be in line with the back. The eyes should be level with, or slightly above, the screen and document. The head should be upright, not slouched over, looking down at the keyboard, or turned to the side.



**Back/Shoulder Position** – When sitting, the back should be upright and parallel to the back of the chair (resting against it rather than leaning against it). The shoulders should be in line with the back and hips; not slouched forward, hunched, or arched backward. Elbows should remain close to the body and forearms should be approximately parallel with the floor. The angle at your elbow should be 90 degrees with your forearms parallel with the floor.



**Foot Position** – When sitting, both of the feet should be flat on the floor or a footrest (the ball of foot and heel should be touching the floor or footrest). The chair should be at a height that allows feet to be positioned this way, while keeping the thighs parallel to the floor, or slightly elevated above the knees.

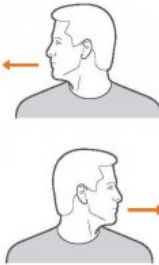


### Microbreaks Guidelines

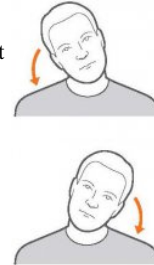
When typing on a computer, a microbreak should be taken approximately every 6 minutes for at least 15-30 seconds. One or multiple of the following stretches should be performed for at least 15-30 seconds during each microbreak.

#### Neck stretches

**Head Turn:** Slowly turn head to side and hold for 10 seconds. Alternate sides and repeat several times.

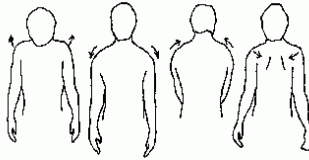


**Head Tilt:** Slowly tilt head to side and hold for 5-10 seconds. Alternate sides and repeat several times.

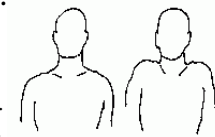


#### Shoulder stretches

**Shoulder Circles:** Lift the shoulders toward the head. Pinch the shoulder blades to roll the shoulders back, and let the shoulders drop down to the starting position. Try to move the shoulders in a circular fashion. Repeat as desired.



**Shoulder Shrugs:** Lift the shoulders toward the head. Hold for a 1-3 seconds and relax. Repeat as desired.



#### Lower back stretch

**Hip and Shoulder Lean:** Stand from chair. With hands on hips and feet about shoulder width apart, slowly lean hips forward and shoulders slightly back. Hold the stretch for 5-10 seconds. Repeat as desired.



## Appendix H

### Exit Interview

1. What did you think the study was about?
2. Why did you think you were asked to watch videos and collect data on others' safety performance?
3. 3a. When you were watching and scoring the videos, did it make you ***think about*** your own safe postures and microbreaks?  
  
3b. What about after, when you started working on the coding task? Did you ***think about*** your safe postures and microbreaks then, as you were working on the computer?  
  
3c. Did you ***think more about*** your safety performance when you were assigned as a participant and the camera was filming you?
4. Did you ***try to improve*** your own performance of safe postures and microbreaks at all during the study? Why or why not?
5. Did you think that ***your performance*** of safe postures and microbreaks was important to the researchers?
6. Did participating in this study make you think more about your posture and microbreaks while working on computer tasks outside of this study?
7. Do you think observing and scoring other people's performance is a reasonable intervention for improving the observer's safe performance? Why or why not?

## Appendix I

### Debriefing Script

Thank you for taking the time to participate in this study. I would like to take a few minutes to tell you about the purpose of this study.

#### **Main purpose:**

The general purpose of this study was to evaluate something called the *Observer Effect*. The observer effect is when people improve their performance of a task after observing and scoring *others* performing that task. So, I looked at this by examining whether you improved your safe postures and increased your use of microbreaks while working on the coding task *after* scoring other people's safe postures and use of microbreaks.

Another purpose of this study was to see whether reactivity makes the observer effect more likely to occur. Reactivity is when people's performance of a task changes when they are aware that someone is observing and evaluating their performance. So, I evaluated how reactivity impacted your performance by telling you at one point during the study that you were a participant, and that I would be filming your safe postures and microbreaks so that other people could score it.

I did this because I wanted to see if you were more likely to demonstrate the observe effect (i.e., improve your safe postures and microbreaks after watching the videos) if you thought that someone was going to observe and score your safe postures and microbreaks as well.

#### **Why this topic is important:**

Gaining more knowledge about the observer effect is important because it can help save people's lives at work. Millions of people in the U.S. are injured each year from accidents that occur in their workplace, so improving safe behaviors at work is a big concern. Organizations trying to improve their safety performance often use something called **peer observations**, which is when employees observe and score their coworkers' safety performance and provide helpful feedback to them. The research on peer observations has shown that, not only do the employees who are *being* observed improve their safety performance, but even the employees conducting the observations show improvements in *their* safety performance as well. This is the observer effect.

I chose to study this because results from previous research on the observer effect have indicated that the observer effect might only occur when the observers believe

that *their* performance of the task will also be observed and evaluated by others. This is reactivity. This is important to know because it would help organizations use peer observations more effectively.

**How and why deception was used in this study:**

When you were given the role of a “data collector”, you were *not* told that your safe postures and microbreaks would be observed while you completed the coding task during your sessions. In order to compare differences in your safe behaviors under this condition to the condition in which you were given the role of a participant (i.e., the condition in which I told you: 1. that a camera was filming you while you were working on the coding task, and 2. that someone would later score your safe postures and microbreaks), I still needed to observe and score your safe postures and microbreaks when you were assigned the role of a data collector. Thus, you were deceived because your safe postures and microbreaks were being scored throughout the entire study. The purpose of this deception was not to trick you in any way. The only reason why this deception was used was to create a condition that minimized your reactivity to the possibility of being observed. In other words, in this condition, we wanted you to think that your safe postures and microbreaks were *not* important to the study and would *not* be observed by the researchers. We only did this to truly evaluate whether reactivity (i.e., the awareness of being observed) impacts the observer effect (i.e., improvements in your safe postures and microbreaks after scoring other people’s safe postures and microbreaks).

**Confidentiality:** All of the information that was collected will be kept confidential. Your name or any other identifying characteristics will not be shared with anyone. If you are uncomfortable in any way with the methods that were used in this study, you are free to withdraw your data from the study.