THE SAFETY OBSERVER EFFECT ACROSS VARIOUS WORK CONDITIONS

by

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Abstract

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The present study was intended to expand on the existing safety observer effect literature which has found that conducting safety observations improves the safety performance of the observer (Alvero & Austin, 2004; Sasson & Austin, 2005). Two experiments were conducted and data were recorded with a hidden video camera. Four undergraduate students served as participants in each experiment (n = 8). In Experiment 1, the effects of conducting safety observations on the safety performance of the observer and the effects of the observer's awareness of observations by the experimenter were examined. In Experiment 2, the combined effects of conducting safety observations and reinforcement and feedback on the safety performance of the observer when working alongside a peer, and the effects of the observer's awareness of observations on both the peer and him/her self were examined. The experimental design used in both experiments was an ABC within-subject design and phases A and C were staggered across groups of behaviors (phase B was not staggered across behaviors). Participants' safety performance did not increase after conducting safety observations nor did their safety performance increase when they were aware that their own, or their peer's, safety performance was being observed. Nevertheless, during Experiment 2, three out of four participants' safety performance increased when reinforcement was offered for typing in a safe manner. No correlation was found between participant's percent accuracy of scoring and participant's

percent safe performance. The implications of these findings as well as suggestions for future research are discussed.

Dedication

This work is dedicated to my best friend, partner in crime, and loving husband Michael. Without you there would be no Ph.D. Thank you for your never ending patience, support, and most of all, your sense of humor.

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Since the 1970's, behavior-based safety (BBS) has helped reduce the number of injuries and accidents in the workplace (Sulzer-Azaroff, Loafman, Merante, & Hlavacek, 1990). BBS is a process that utilizes performance management and the principles of applied behavior analysis to increase occupational and personal safety (Sasson & Austin, 2005). A behavioral approach enables one to pinpoint target behaviors and motivate workers to perform in a safe manner. Positive reinforcement, rather than aversive techniques, is responsible for the change in employee behavior (Komaki, Barwick, & Scott, 1978).

According to Alavosius, Adams, Ahern, and Follick (2000), successful safety performance management is accomplished by arranging the relations between antecedents, behaviors, and consequences in a way that will increase the occurrence of safe behavior thus decreasing the occurrence of unsafe behavior. The first main step in a behavioral safety process requires reviewing incident reports that can pinpoint unsafe behaviors and the context in which they occurred. Alavosius et al., (2000) suggest pinpointing can help detect the variables that expose employees to injury which in turn can help behavior analysts specify the safe behaviors that will be used to replace the unsafe behaviors. Pinpointing consists of two phases: 1) The first phase involves describing the behavior a person engages in without using labels to describe their behavior. For example, if an employee fails to wear safety goggles while working with hazardous materials, the employee's behavior would be described as "failure to wear

goggles" rather than labeling the employee as "forgetful." 2) The second phase involves describing the target behavior. In the previous example, the goal would be to increase the amount of time the employee wears his or her safety goggles while working with hazardous materials (McSween, 2003).

The second main step in a behavioral safety process is to break down the target behaviors into very specific steps to enable an objective system of data collection as well as a behavioral analysis. Breaking down the target behaviors allows one to determine the events that immediately precede and follow the behavior in question. In other words, one can determine which events are triggering and maintaining the behavior that needs to be changed. Once the target behaviors are operationally defined, employees can be trained using modeling, shaping, goal-setting, and positive reinforcement for reaching a certain criterion (Alavosius et al., 2000; McSween, 2003).

Sulzer-Azaroff and Austin (2000) suggest that the behavioral safety process requires developing and implementing mechanisms for measuring target responses to determine their current status and setting attainable goals for improvement, providing feedback to employees on their safety performance, and providing reinforcement for safe behavior.

Blake-McCann and Sulzer-Azaroff (1996) conducted a study to examine the effectiveness of behavioral training combined with ergonomic and biomechanical approaches on the reduction of carpal tunnel syndrome (CTS) risk. The participants were six full-time secretaries and there were three target responses. The first target response was posture which was operationally defined as having (1) a straight back with the spine at an 85-90 degree angle to the floor, (2) relaxed shoulders with the line of the shoulders

not hunched upward toward the neck or over the chest, (3) neck and back aligned with a continuation of the spine, (4) flat feet with the heels and toes of both feet touching the floor (legs not crossed), and (5) both forearms parallel to the floor. The next target response was the deviation of the hand-wrist position from a neutral position (the midpoint of the joint angle between the hand and wrist). Finally, the third target response was data entry rate. Estimates of keystrokes per minute and correct words per minute were recorded to monitor how changes in posture and hand-wrist positions affected performance. Participants were randomly divided into two groups; one for self-monitoring posture (SMP) and one for self-monitoring hand-wrist position (SMHW). A multiple-baseline-across-subjects procedure was used, and all participants received the intervention in the same order but self-monitored only one of the two target behaviors (posture or hand-wrist position).

Participants all received orientation and instruction on use of equipment and chair adjustment before baseline data were taken on their performance. Baseline continued until performance stabilized with no new highs or lows occurring for three consecutive sessions.

The discrimination training phase began after baseline. During the discrimination training phase, a training packet was given to each of the participants. This packet contained information on CTS and strategies to prevent it such as correct posture and hand-wrist positions. A laminated card was included with the packet that illustrated correct posture and an outline of both target behaviors. Participants were asked to keep the card on or near the keyboard in their office. The information in the packet was reviewed with all participants. Afterwards, the participants were shown a series of

photographs of a person sitting at a keyboard using various combinations of correct and incorrect posture components. The participants scored some sample problems with the experimenter and then scored ten examples on their own. The experimenter delivered immediate feedback for each example and any errors were discussed. Participants were required to obtain a minimum of 80% correct before starting the self-monitoring phase.

During the self-monitoring phase, participants in the SMP group were taught to self-monitor their posture and participants in the SMHW group were taught to self-monitor their hand-wrist position. Each participant had a self-monitoring form on their desk and at the end of each session they were instructed to estimate the percentage of time they engaged in the correct behavior during the session. Once performance stabilized, feedback, goal-setting, and reinforcement were provided at the beginning of each session based on data from the previous sessions. At first, participants in both groups only received feedback, goal-setting, and reinforcement relevant to the behavior they self-monitored. After three sessions, participants in both groups were given feedback, goal-setting, and reinforcement for both behaviors (the behavior they were self-monitoring as well as the behavior they were not self-monitoring). The researchers found that all participants in the SMP group improved their posture from an average of approximately 80% safe during baseline to an average of approximately 100% safe during intervention and improved their hand-wrist position from an average of approximately 45% safe in baseline to an average of approximately 95% safe during intervention. All participants in the SMHW group improved their posture from being safe an average of approximately 86% of the time during baseline to an average of approximately100% of the time during intervention, and improved their hand-wrist

position from being safe an average of approximately 13% of the time during baseline to an average of approximately 45% of the time. Furthermore, the intervention did not impede their typing performance.

BBS can be used to increase safety behavior across a wide variety of settings. While Blake-McCann and Sulzer-Azaroff (1996) used BBS to increase safety behavior in an office setting, Austin, Alvero, and Olson (1998) used BBS to increase the safety behavior of automobile drivers. The latter research found that verbal prompts from restaurant hostesses increased the seat belt use of customers leaving the restaurant. Their findings suggest that prompts can be effective regardless of whether or not they immediately precede the target behavior.

In addition to office and automobile safety, BBS has been used to improve the safety conditions in large factories. Komaki, Barwick, and Scott (1978) used a behavioral approach to improve safety behavior in two departments (wrapping and make-up) of a food manufacturing plant. In the make-up department of the factory, the ingredients were measured, mixed, baked, and packaged. In the wrapping department of the factory, the packages were bagged, sealed, labeled, and packed into cartons for shipment. During baseline, a behavioral analysis confirmed that safe behavior was not being maintained by employees because there was very little reinforcement for safe performance. The intervention consisted of a training component and a motivational component. During training, employees watched slides of people engaged in safe and unsafe behavior. When unsafe behavior was shown, the experimenters asked employees to identify what was wrong with the behavior. After the question was answered, a slide was shown of a person performing the same task in a safe manner. Next, a list of safety

reminders and a graph of their safety performance were displayed in the working area. In addition to the above-listed intervention components, supervisors were required to give behavior-specific praise to employees when they were acting in a safe manner.

After 61 sessions during the intervention phase, a return to baseline was implemented during which the observers no longer observed employees nor provided feedback. Direct observation along with positive reinforcement for safe behavior resulted in an increase in the safety performance of the wrapping department from an average of 70% safe in baseline to an average of 96% safe during intervention and safety performance decreased to an average of 71% during the reversal phase. The average safety performance of the make-up department increased from an average of 78% in baseline to an average of 99.3% during intervention and decreased to an average of 72% during the reversal phase.

Although there is an abundance of literature on the effectiveness of BBS there are not many studies which analyze the specific components of the behavioral safety process, specifically the observation process. The observer effect can be defined as the effect that conducting safety observations of target responses has on the observer's safety performance of those same target responses (Alvero & Austin, 2004). In other words, observing and collecting data on someone else's safety performance seems to improve the observer's own performance of those responses. Alvero and Austin (2004) recently demonstrated that conducting safety observations may increase the safety performance of the safety observers. This information is very important to behavioral safety consultants specifically because of the change in business practice from management-driven safety programs to employee-driven programs (McSween, 2003). Because of the added benefits

that conducting safety observations might have on the safety performance of the observers/employees, employee-driven programs require employees to conduct safety observations and deliver safety performance feedback. Although this shift occurred prior to the establishment of any research to support this change, the relevant research on the observation process seems to support this transition.

Alvero and Austin (2004) conducted a laboratory study in a setting designed to resemble an office. Participants were eight undergraduate students who were asked to perform three types of office tasks. The tasks included 1) typing a few paragraphs on a computer or word processor, 2) dialing a phone number and leaving a message on the answering matching, and 3) picking up a cardboard box that had five pieces of paper in it, putting it on a chair, taking out one piece of paper, and then putting the box back on the floor. The baseline phase required participants to perform the above-defined tasks for 15 minutes. Safe performance was measured on the following eight target behaviors: a) back straight when lifting, b) knees bent when lifting, c) neck position when typing, d) wrist position when typing, e) back position when sitting, f) shoulder position when sitting, g) feet position when sitting, and h) neck alignment when using the phone.

After baseline performance stabilized, participants were exposed to an information phase. During the information phase, participants were provided with a handout listing four of the eight target behaviors and definitions of how to perform each safely. During the observation phase, at the beginning of each session, participants were asked to watch a 5-minute video of a confederate engaging in tasks similar to those assigned to the participants. The confederates engaged in a combination of both safe and unsafe target behaviors. The participants collected data on the confederate's safety

performance using a checklist given to them by the experimenter. The safety checklist contained the same four target behaviors presented to them during the information phase. After the participants collected data on the confederate, the participants were asked to perform the same tasks as those presented during baseline. When their performance on the first set of four target behaviors stabilized, the remaining four target behaviors were added to the checklist and thus, exposed to the observation condition. The following table summarizes the results of the Alvero and Austin (2004) study. The numbers listed in the table represent the mean safety performance for all eight participants.

	Back During Lifting	Knee Bends	Wrist Position	Neck Position	Back Posture While Sitting	Shoulder Position	Feet Position	Neck During Phone Usage
Baseline	1%	5%	0%	31%	7%	3%	8%	7%
Observation	50%	70%	68%	81%	79%	77%	91%	76%

An extension of the Alvero and Austin (2004) study was conducted by Sasson and Austin (2005). They assessed the effects of conducting observations on the behavior of the observer in an applied setting and then addressed the effects of observer accuracy on the performance of ergonomic responses. Participants were 11 women who had clerical positions in a hospital. Information on the correct and incorrect topographies of ergonomic behavior was given to each participant. Participants were trained to observe others by reaching a criterion of 60% agreement with the experimenter while scoring the behavior of a confederate. Participants were aware that they were being observed because of their close proximity to the participant observers and/or experimenters. Every participant observer and an experimenter conducted a joint observation of a non-observer participant during morning sessions. After this joint observation, the experimenters observed the behavior of the participant observers who had completed observations of

non-observer participants earlier in the session. Before each afternoon session, feedback was given to each participant regarding their safety performance based on data collected in the morning session. The experimenters then observed the behavior of all the participants in the study during afternoon sessions. Feedback was always combined with conducting observations. No feedback was given on the performance of the afternoon session.

The primary target responses were (a) wrist position –the wrist should be in line with the elbows while the person is typing, (b) neck position –the neck should be in line with the back and eyes should be level with the computer screen while the person is typing, (c) back/shoulder position – the back should be upright, parallel to the back of the chair but not leaning against it and shoulders should be in line with the back and hips while the person is typing, and (d) foot position – both feet should be flat on the floor while the person is typing. Data were also collected on the accuracy of participant observations and participant exit interviews were conducted. The results indicated safety performance was enhanced when participants were given information and training.

These results were better maintained when participants conducted observations than when they did not. Secondary measures were also collected on the accuracy of participant observations. Participant observers used a momentary time sampling procedure to collect data on the behavior of participant non-observers. Accuracy of observations was calculated for all participant observations by comparing their data to the experimenter's data. A Pearson r correlation was calculated for all participant observers. The results revealed there was a correlation between the level of observer accuracy and the amount of behavior change in the observer for three of the participants.

It is advisable to use caution when interpreting the results of the Alvero and Austin (2004) and Sasson and Austin (2005) studies, specifically because the participants were aware they were being observed throughout the study. Therefore, it is difficult to speculate whether a similar "observer effect" would occur if the participants were unaware they themselves were being observed.

Experiment 1

The present study was an attempt to expand on the existing safety observer effect literature (Alvero & Austin, 2004; Sasson & Austin, 2005) by recording all sessions with a hidden video camera rather than informing the participants that their sessions were going to be observed by the experimenter. Experiment 1 examined the effects of conducting safety observations on the safety performance of the observer and the effects of the observer's awareness of observations by the experimenter. The experimental design was an ABC within-subject design and phases A and C were staggered across groups of behaviors (phase B was not staggered across behaviors).

Method

Participants & Setting

Participants were four undergraduate students who attended a northeastern university. The ability to touch type, or type with both hands on the keyboard without having to look at the keyboard, was a prerequisite skill (refer to *participant recruitment and informed consent* subheading on page 14 for details). Participants were paid $10 per hour ($5.00 per half hour session). The setting was a university laboratory that had been designed to resemble an office setting. The simulated office environment consisted of three rooms: one observation room, one monitoring room, and one typing room.

Apparatus

A *PalmVid Wireless Camera Model # PVCUBE CLOCK700*, *PalmVid Wireless Video Camera Receiver model # PVTRANSREC700, and a Dell Optiplex GX270* computer were used to record all participant sessions in the monitoring room. The *Dell Optiplex GX270* ran with *Windows XP (version 2002)*, and used *Windows Media Player*

10 for playing DVDs, a *Dell* 15" monitor *(model # 1703FP),* and a *Dell* keyboard and mouse *(model # CE-506)*. An *Iconico Screen Protractor 3*.3 was used to measure the ergonomic positions of the participants. The computer the participants typed on was equipped with Windows Millennium Edition, Microsoft Word 2000 as the word processor, a 12.5 inch monitor, and a standard key board and mouse.

During the observation phase, participants used a *Dell Optiplex GX270* run with *Windows XP (version 2002)*, and used *Windows Media Player 10* for playing DVDs, a *Dell* 15" monitor *(model # 1703FP),* and a *Dell* keyboard and mouse *(model # CE-506)* to view the DVDs of a confederate typing.

Definitions and Measurement of Dependent Variables

Participant performance was measured on the six target responses listed below. The target definitions were modified from the OSHA Ergonomic Solutions webpage (2003):

1. Head and neck to be upright, or in-line with the torso - not bent down or back. Center-back of head must be no less than 175° from back tip of buttocks.
2. Trunk should be perpendicular to the floor.
3. Shoulders and upper arms to be in-line with the trunk/torso, generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outer most part of the back. Top-back of shoulder must be between 175° and 195° to back tip of buttocks.
4. Forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173° and 183° to pinky knuckle.

5. Thighs to be parallel to the floor and lower legs to be perpendicular to the floor (between 80° and 100°). Thighs may be slightly elevated above knees.
6. Both feet rest flat on the floor.

Safety performance was taped via a hidden video camera. A 30-second momentary-time sampling system (MTS) was used to measure engagement in safe behavior using the DVDs of each session. Every 30 seconds, a research assistant observed the participant to determine if the participant was safely performing each of the six target responses. The observations were recorded on a data sheet (see Appendix A).

Definitions and Measurement of Secondary Variables

Accuracy of observations. The data collected by each participant on the behavior of the confederate in the DVDs were compared to the data collected by the experimenter on the behavior of the confederate in the DVDs (for agreement as a measure of participant observation accuracy). The experimenter was the primary data collector and the participants were the secondary data collectors. Any deviations from the data obtained by the primary data collector were considered disagreements. Percent accuracy was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

Correlation between scoring and performance. A Pearson r correlation was calculated to determine if there was a positive correlation between the accuracy of the data collected by each participant on the behavior of the confederate in the DVDs during one session and the safety performance of each participant later on during that same session. A Pearson r correlation was also calculated to determine if there was a positive correlation between the safety performance of each participant during one session and the

accuracy of the data collected by each participant on the behavior of the confederate in the DVDs during the following session.

Participant exit interview responses. Each participant was asked a series of questions (Appendix B) during the debriefing session. These questions were obtained from Sasson and Austin (2005) and modified to be relevant for the current study. The exit interviews were tape recorded by the researcher during the debriefing session and transcribed at a later time. The responses given by the participants are listed next to the corresponding questions in Appendix B.

Number of words typed per session. Data collection was performed with Microsoft Word tools to take a word count on the number of words each participant completed after each session. Any incorrectly spelled words (found with spell check), skipped words, and/or added words were subtracted from the total word count given by Microsoft Word.

Definitions of Treatment

The treatment conditions for this study were:

1) information about ergonomically correct typing behaviors.

2) conducting safety observations[1] for approximately seven minutes at the start of every session in the observation phase.

3) direct observations by the experimenter while the participant was typing.

[1] Throughout this manuscript, the phrase "conduct safety observations" will refer to observing and collecting data on the safety behaviors of another person or confederate.

Stability Criteria

The criteria for stable performance were that the participant's safety percentage must fall within a ±10 percent in the absence of any consecutive upward trends for the relevant target responses. For example, if a participant had consecutive data points of 40%, 39%, 42%, and 43% it was considered an upward trend. There was no set number of stable consecutive data points that was required before moving on to the next session. If safety performance did not stabilize, the relevant target responses were intervened on after 11 sessions as long as there was no upward trend.

Procedure

Participant recruitment and informed consent process. The experimenter displayed flyers around the university where the study was conducted. When people contacted the experimenter about the study, the experimenter explained that participation required them to come to the laboratory for approximately thirty 30 minute sessions, and perform a typing task. The experimenter then asked the person if they were able to touch type. Before the onset of the baseline phase, the participant had to pass a simple test given by the experimenter to see if the participant was able to touch type. The test consisted of giving the participant a page that had been copied from an introductory psychology textbook (Appendix C) (Davison & Neale, 1996) and asking the participant to type the paragraphs on the page into the computer. If the potential participant was able to correctly touch type at least 10 words per minute and was interested in taking part in the study, the experimenter gave the participant an informed consent form to sign (Appendix D). The experimenter then adjusted the participant's chair to an ergonomically correct position. The experimenter also adjusted the height of the

computer screen. Measurements of the chair and computer screen were recorded so the experimenter could adjust the chair and computer screen for each participant before each experimental session throughout the study. After the participant signed the consent form, the experimenter made a copy of it for the participant to keep.

Institutional review board (IRB) procedures. Due to the use of a hidden camera, considered a level of deceit, in this study, IRB approval was relatively challenging to obtain. The experimenter was required to employ two different consent forms for IRB approval. Participants were asked to review and sign one consent form (Appendix D) at the beginning of the study that provided a general description of the purpose of the study and simply gave the experimenter permission to recruit the participant for the current study. Upon completion of study, participants were asked to review and sign the second consent form (Appendix M) that included more procedural details including the use of the hidden camera. This second form granted the experimenter permission use of the video footage, and thus corresponding data, collected during the study. If a participant refused to sign the second consent form, the participant was allowed to keep any money he/she had earned as a result of participation in the study, but the experimenter was required to destroy all video footage and data of the participant that were collected during the study. A total of five participants were recruited for participation in Experiment 1 and only four agreed to sign the second consent form. Therefore, only the results and analysis from four participants are included in the present study.

Research assistant training and reliability. Before participants were recruited, research assistants met for training sessions. The experimenter did not review the study with the assistants to ensure that they were blind to the study. Not reviewing the study

with the research assistants helped prevent any bias during data collection. The assistants were encouraged to ask questions so they fully comprehended what was expected of them. During the second meeting the research assistants watched a DVD of a confederate engaged in safe and unsafe typing behavior. They were required to collect data on the safety behavior of the confederate using the same data collection sheets that they used to collect data on the participants. Each assistant was required to score 100% agreement on the checklist when compared to the data collected by the experimenter for three consecutive sessions.

Baseline. Participants were instructed to engage in the typing task for 20 minutes per session (Appendix E). There was a set of eight pages that had been copied from an introductory psychology textbook similar to the page used in the participant recruitment typing test (Appendix C). The pages were assigned as follows: for session 1 page 1 was used, for session 2 page 2 was used, and so on and so forth. For session 9 page 1 was used again, for session 10 page 2 was used again, and so on and so forth. All sessions were recorded via a hidden camera. Participants remained in baseline until safety performance met the stability criteria.

Information phase. Information was provided to participants on the topographies of ergonomically correct typing responses at the beginning of each session during the information phase. A sheet describing three of the six target responses was given to each participant at the beginning of every session during the information phase and read to them by the experimenter. The target behaviors on which the participant received information were assigned to participants using block randomization. Half the participants were given information on responses for head and neck, shoulder, and leg

positions (Appendix F) and the other half were given information on responses for forearms, trunk, and feet positions (Appendix G). During the first session of the information phase, the experimenter explicitly told the participants that they should engage in those three target responses while they were typing. During the first session of the information phase, the experimenter also asked the participants to demonstrate the three target responses correctly and incorrectly. The demonstration served as the measure of the integrity of the independent variable. The purpose of this phase was to assess the effects of safety information on safety performance. Participants remained in the information phase until safety performance met the stability criteria.

Observation phase. At the start of each session in the observation phase, participants were asked to watch a seven-minute DVD of a confederate engaged in typing. They watched the DVD in a different room from the one they typed in. The participants collected data on the confederate's safety performance shown on the DVD using a whole-interval time-sampling system of 25 seconds. Prior to watching the DVD of the confederate, the experimenter instructed the participant on how to collect data (see Appendices H and I). An interval was scored as "safe" if the confederate performed safely for the entire 25 second interval, otherwise it was scored as "unsafe." Throughout the DVD, the confederate was engaging in both safe and unsafe behavior. They only collected data on the three responses they were exposed to during the information phase. Participants were given a checklist containing the same three target responses for which they received information (Appendices J and K). The checklist was comprised of definitions of how to perform each target response, and columns to score the confederate's behavior as safe or unsafe. After each 25 second DVD interval, the

computer screen went blank for approximately ten seconds to give the participants time to record the data on the confederate shown in the DVD. After the ten second "pause" was over, there was another 25 second interval of the confederate typing. There were five different five-minute DVDs of a confederate typing on a computer. The DVDs were rotated in the following way: DVD 1 was used for session 1, DVD 2 was used for session 2, and so on and so forth. For session 6, DVD 1 was used again, and DVD 2 was used for session 7, and so on and so forth for the extent of the study.

After observations were conducted, the participants returned to their "work environment" and the procedures mimicked baseline. The remaining three target responses were introduced to the observation phase after participant safety performance stabilized on the first three target behaviors exposed to the observation intervention or until 10 sessions had elapsed in the observation phase, and thus added to the checklist. (Appendix L).

Direct observations. Participants were exposed to direct observation probes. During these probes, the experimenter came into the room in which the participant was typing, sat down while looking at the participant, and collected data on the participant's behavior. The experimenter told the participant, "I'm going to collect data on your safety behavior for a couple of minutes." The observations only occurred in the room in which participants typed. Probes occurred during every third session and lasted two minutes. The purpose of these probes was to examine whether participant safety performance varied during direct observations. Data were analyzed and graphed minute-by-minute for sessions during which a probe occurred. Each session lasted 20 minutes. The purpose of these probes was to see if there were any changes in safety performance before, during,

or after the two minute probe. Direct observations were only conducted during the information and observation phases.

Interobserver agreement. Two independent observers collected data on participants' performance on at least 40% of the sessions in each phase of the study. Each session consisted of 40 observations of participant behavior for each of the six target responses. Interobserver agreement (IOA) was calculated by dividing the total number of agreements for each session by the total number of agreements plus disagreements for each session and multiplying by 100. If IOA fell below 90%, all research assistants were retrained.

Integrity of the Treatment Implementation

Experimental design. An ABC within-subject design was used to assess the effects of conducting observations on safety performance. Phases A (baseline) and C (observation) were staggered across groups of behaviors [phase B (information) was not staggered across behaviors]. The effects of direct observations were assessed with minute-by-minute graphs of the participants' safety behavior during probe sessions.

Debriefing process. Participants were debriefed (Appendix N), thanked, and paid for their time once all the data were collected for that person. The experimenter explained to each participant that their performance had been recorded via a hidden camera and showed them the graphs of their performance. Each participant must have given written consent to allow their video footage and any additional data to be used in the study (Appendix M). If the participant did not give their written consent, all relevant data and video footage collected were destroyed. During Experiment 1, one of the participants would not give final, written consent to allow the experimenter to use the

data collected on her. Therefore, there were a total of five participants in Experiment 1 but the data presented in the current study are only from four participants.

Results

Figure 1 displays the safety performance and accuracy of scoring data for participant 1. The data are summarized in Table 1. The numbers indicate the median scores as well as the mean percentage of time participant 1 engaged in safe typing behavior for each target response. A baseline shift occurred for the three responses that were not exposed to the information phase. This shift, or increase in responding during baseline, coincided with the introduction of the information phase for the other three target responses. Therefore, the baseline data in Table 1 are separated into "pre" and "post" baseline shift means. The data for participants 1-4 are displayed using the same type of table.

Table 1. Median scores and mean percentage of time participant 1 engaged in safe typing behavior for each target response.

	Head and Neck Position	Shoulder	Leg Position	Forearm Position	Trunk Position	Feet Position
Pre-Baseline Shift (Mean)	100%	97%	4%	17%	31%	4%
Pre-Baseline Shift (Median)	100%	100%	0%	14%	13%	0%
Post-Baseline Shift (Mean)	N/A	N/A	N/A	32%	99%	91%
Post-Baseline Shift (Median)	N/A	N/A	N/A	26%	100%	100%
Information (Mean)	100%	100%	53%	N/A	N/A	N/A
Information (Median)	100%	100%	58%	N/A	N/A	N/A
Observation (Mean)	100%	100%	96%	5%	100%	98%
Observation (Median)	100%	100%	100%	0%	100%	100%

Figure 1. Safety data and accuracy of scoring with mean lines across phases for Participant 1. The two lines in the baseline phase for forearm, trunk, and feet positions indicate where a baseline shift occurred. The open circles indicate sessions where the experimenter observed the participant. The triangles indicate the accuracy of scoring by Participant 1.

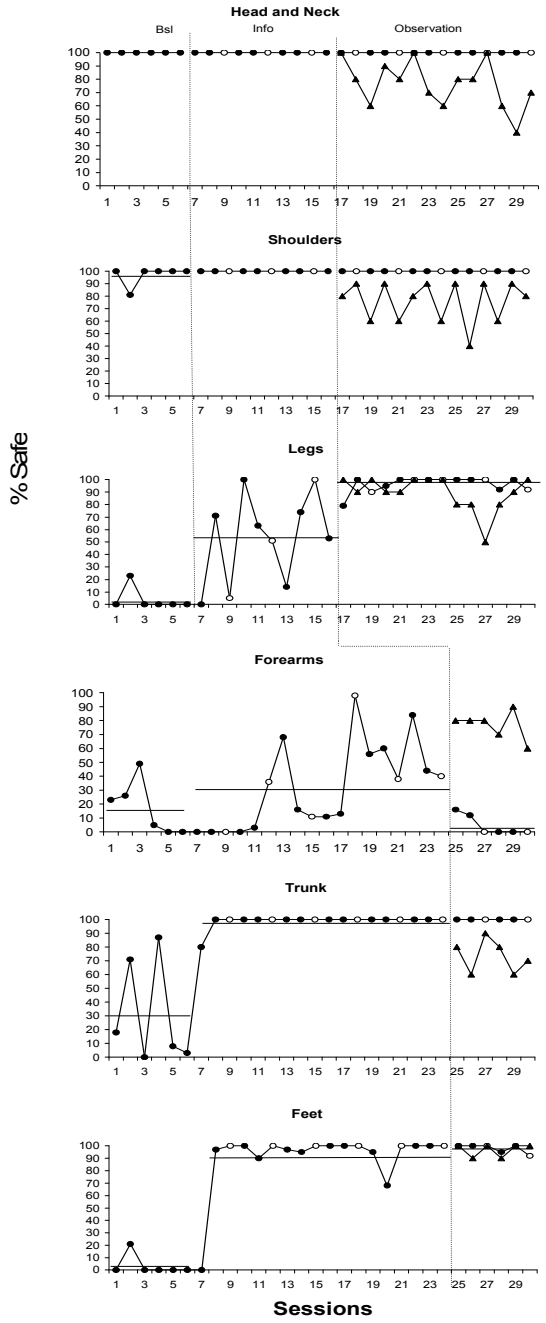


Table 2. Median scores and mean percentage of time participant 2 engaged in safe typing behavior for each target response.

	Head and Neck Position	Shoulder	Leg Position	Forearm Position	Trunk Position	Feet Position
Pre-Baseline Shift (Mean)	100%	100%	0%	0%	0%	0%
Pre-Baseline Shift (Median)	100%	100%	0%	0%	0%	0%
Post-Baseline Shift (Mean)	N/A	N/A	N/A	45%	51%	98%
Post-Baseline Shift (Median)	N/A	N/A	N/A	36.5%	57.5%	100%
Information (Mean)	100%	100%	14%	N/A	N/A	N/A
Information (Median)	100%	100%	11.5%	N/A	N/A	N/A
Observation (Mean)	100%	100%	94%	42%	41%	92%
Observation (Median)	100%	100%	100%	43.5%	5%	100%

Figure 2. Safety data and accuracy of scoring with mean lines across phases for Participant 2. The two lines in the baseline phase for forearm, trunk, and feet positions indicate where a baseline shift occurred. The open circles indicate sessions where the experimenter observed the participant. The triangles indicate the accuracy of scoring by Participant 2.

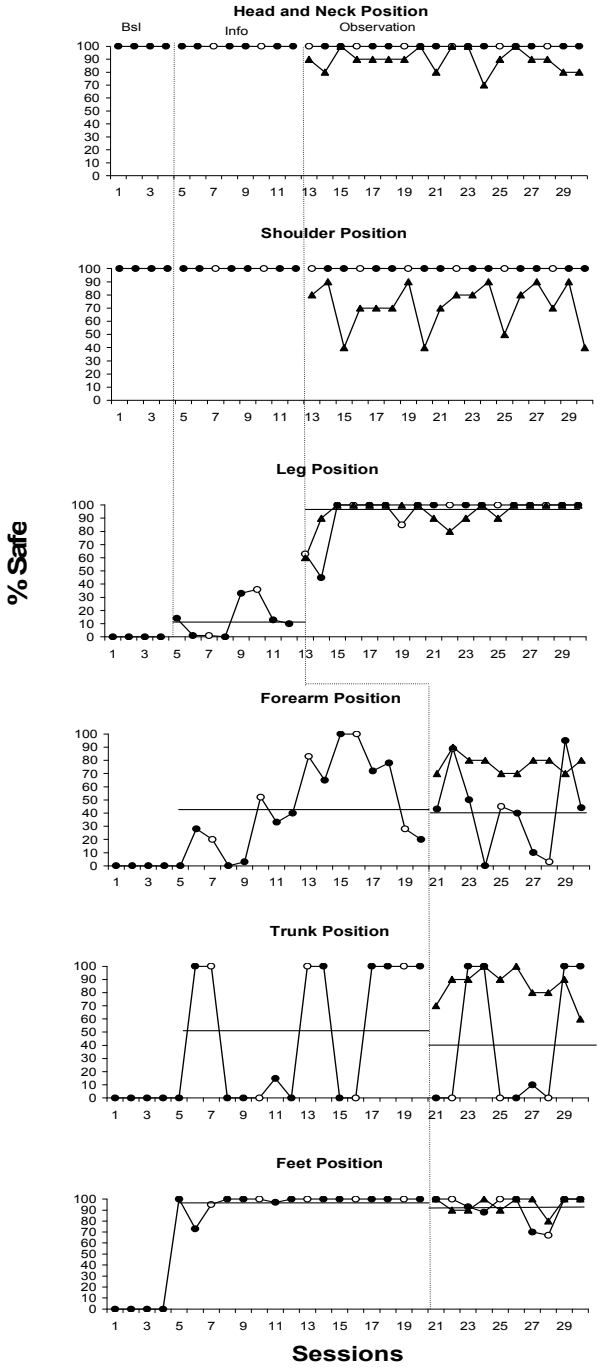


Table 3. Median scores and mean percentage of time participant 3 engaged in safe typing behavior for each target response.

	Forearm Position	Trunk Position	Feet Position	Leg Position	Head and Neck Position	Shoulder Position
Pre-Baseline Shift (Mean)	23%	74%	44%	16%	63%	60%
Pre-Baseline Shift (Median)	16.5%	89%	33.5%	7%	68%	63.5%
Post-Baseline Shift (Mean)	N/A	N/A	N/A	51%	95%	98%
Post-Baseline Shift (Median)	N/A	N/A	N/A	51%	100%	100%
Information (Mean)	35%	100%	52%	N/A	N/A	N/A
Information (Median)	27.5%	100%	54.5%	N/A	N/A	N/A
Observation (Mean)	50%	93%	86%	48%	94%	91%
Observation (Median)	56%	97%	100%	43%	97%	100%

Figure 3. Safety data and accuracy of scoring with mean lines across phases for Participant 3. The two lines in the baseline phase for head and neck, shoulder, and feet positions indicate where a baseline shift occurred. The open circles indicate sessions where the experimenter observed the participant. The triangles indicate the accuracy of scoring by Participant 3.

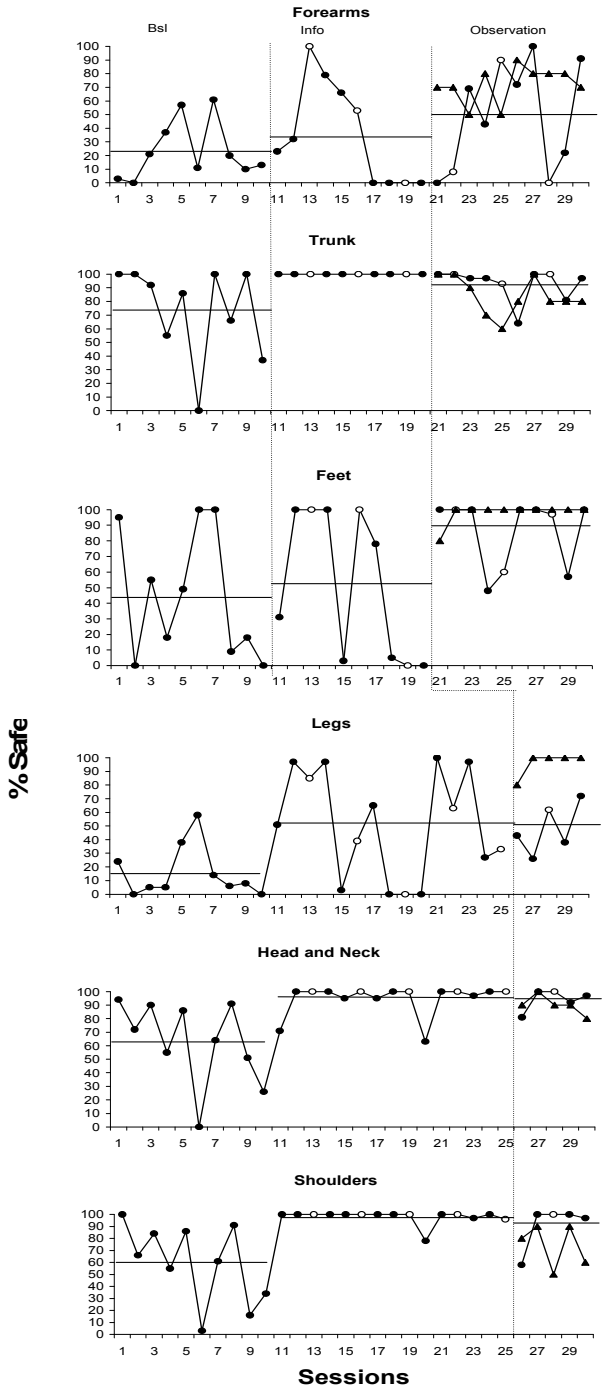
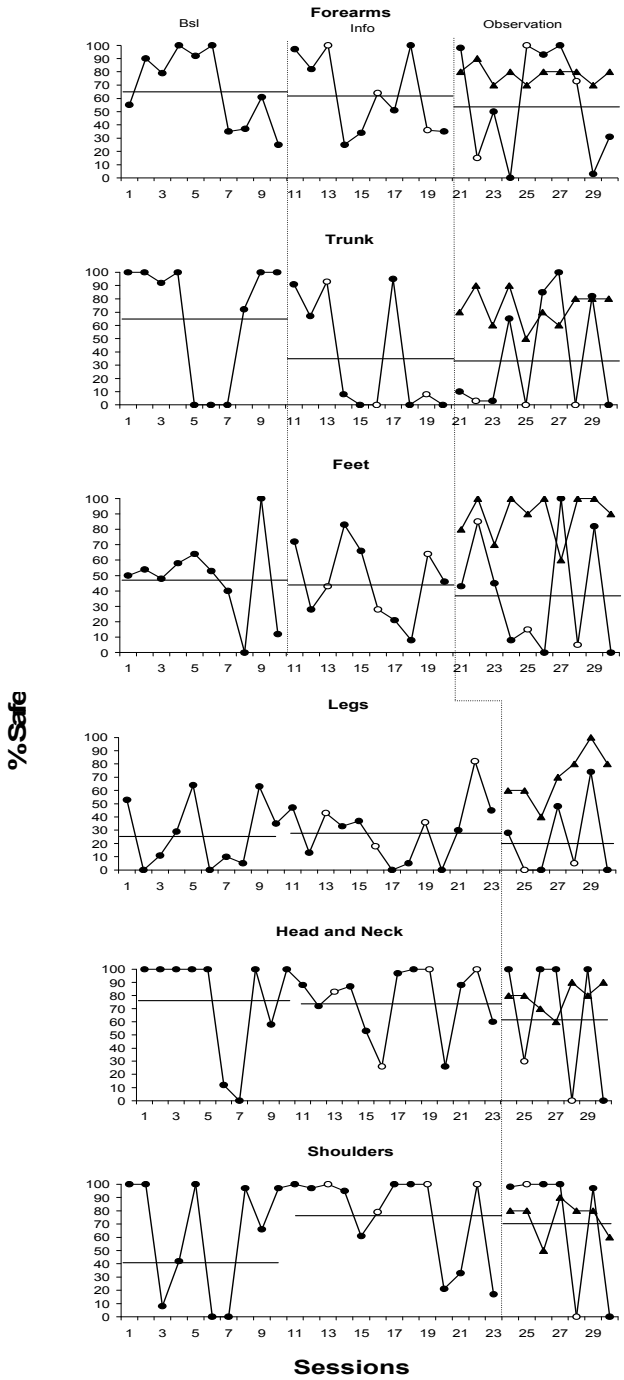


Table 4. Median scores and mean percentage of time participant 3 engaged in safe typing behavior for each target response.

	Forearm Position	Trunk Position	Feet Position	Leg Position	Head and Neck Position	Shoulder Position
Pre-Baseline Shift (Mean)	67%	66%	48%	27%	76%	41%
Pre-Baseline Shift (Median)	70%	96%	51.5%	20%	100%	81.5%
Post-Baseline Shift (Mean)	N/A	N/A	N/A	30%	74%	77%
Post-Baseline Shift (Median)	N/A	N/A	N/A	33%	87%	97%
Information (Mean)	62%	36%	46%	N/A	N/A	N/A
Information (Median)	57.5%	8%	44.5%	N/A	N/A	N/A
Observation (Mean)	56%	35%	38%	22%	61%	71%
Observation (Median)	61.5%	6.5%	29%	5%	100%	98%

Figure 4. Safety data and accuracy of scoring with mean lines across phases for Participant 4. The two lines in the baseline phase for head and neck, shoulder, and feet positions indicate where a baseline shift occurred. The open circles indicate sessions where the experimenter observed the participant. The triangles indicate the accuracy of scoring by Participant 4.



It was also found that the participants' accuracy of scoring the DVDs of the confederate at the beginning of one session did not increase along with their safety behavior later on during the same session. A Pearson r correlation was calculated to determine if there was a correlation between the accuracy of scoring and the safety performance of the participants at the .05 alpha level. Three correlations were calculated for participant 1, four for participant 2, and 6 correlations were calculated for participants 3 and 4. The means of all correlations calculated for each participant are as follows: participant 1 (-.24), participant 2 (.09), participant 3 (.44), and participant 4 (-.12). The difference in number of correlations calculated for each participant is because opportunities for correlations were limited due to ceiling effects where all safety behavior or accuracy scores were 100%. There were 24 opportunities to calculate a correlation but only 19 correlations were able to be calculated due to ceiling effects. Of the 19 correlations that were calculated, seven were positive, 11 were negative and one was zero. The accuracy of scoring at the beginning of one session did not correlate with the safety behavior of the participant later on during the same session. The only exceptions were the correlations between accuracy and safety for trunk position for participant 3 ($r = .73$; $p = 0.023$; $df = 7$) and leg position for participant 2 ($r = .77$; $p = 0.000$; $df = 15$). The correlations are based on the number of sessions for each participant involving watching and collecting data on the confederate in the DVD as well as typing. Therefore, the degrees of freedom are smaller for some target responses than for other target responses since participants collected data on some target responses before collecting data on other target responses. For example, participant 1 started collecting data on the head and neck, shoulders, and leg positions of the confederate in the DVD before collecting data on the

forearms, trunk, and feet position. Participant 1 collected data on head and neck, shoulder, and leg positions of the confederate in the DVD during sessions 17-30 whereas data were collected on the forearms, trunk, and feet positions during sessions 25-30. The degrees of freedom for each participant and each target response are listed in table 5.

Table 5. Degrees of freedom for correlations calculated between accuracy of scoring at the beginning of each session and safety behavior later on during the same session for each participant. Numbers in the table indicate the degrees of freedom. N/A indicates no correlation was able to be calculated due to a ceiling effect where all scores for safety behavior or accuracy of scoring were 100%

	Head and Neck Position	Shoulder Position	Leg Position	Forearm Position	Trunk Position	Feet Position
Participant 1	N/A	N/A	11	3	N/A	3
Participant 2	N/A	N/A	15	7	7	7
Participant 3	2	2	2	7	7	7
Participant 4	4	4	4	7	7	7

Additionally, there was no correlation between the safety performance of the participants on one session and the participant's accuracy of scoring the DVD of the confederate on the following session. A Pearson r correlation was calculated to determine if there was a correlation between the safety performance of the participants and the accuracy of scoring at the .05 alpha level. As with the correlations between the participants accuracy of scoring at the beginning of one session and the safety behavior of the participants later on during the same session, the correlations between the safety performance on one session and the accuracy of scoring the DVD on the following session were based on the number of sessions for each participant involving watching and collecting data on the confederate in the DVD as well as typing. Therefore, the degrees of freedom are smaller for some target responses than for other target responses since participants collected data on some target responses before collecting responses on other target responses. The degrees of freedom for each participant and each target response are listed in table 6.

Three correlations were calculated for participant 1, four were calculated for participants 2 and 3, and six correlations were calculated for participant 4. The mean of the correlations for each participant are as follows: participant 1 (-.05), participant 2 (.13), participant 3 (-.22), and participant 4 (.11). The difference in number of correlations calculated for each participant is due to the fact that correlations were not always able to be calculated due to ceiling effects where all accuracy of scoring or safety behavior scores were 100%. There were 24 opportunities to calculate a correlation but only 17 correlations were able to be calculated due to ceiling effects. Of the 17 correlations that were calculated, eight were positive and nine were negative.

Table 6. Degrees of freedom for correlations calculated between safety behavior during one session and accuracy of scoring at the beginning of the following session for each participant. Numbers in the table indicate the degrees of freedom. N/A indicates no correlation was able to be calculated due to a ceiling effect where all scores for safety behavior or accuracy of scoring were 100%.

	Head and Neck Position	Shoulder Position	Leg Position	Forearm Position	Trunk Position	Feet Position
Participant 1	N/A	N/A	11	3	N/A	3
Participant 2	N/A	N/A	15	7	7	7
Participant 3	2	2	N/A	7	7	N/A
Participant 4	4	4	4	7	7	7

Data were also collected on the words typed per session for each participant. Figure 5 displays the words typed per session for each individual participant across all three phases of Experiment 1.

Figure 5. Words typed per session for each individual participant across all three phases. Open circles indicate experimenter probe sessions.

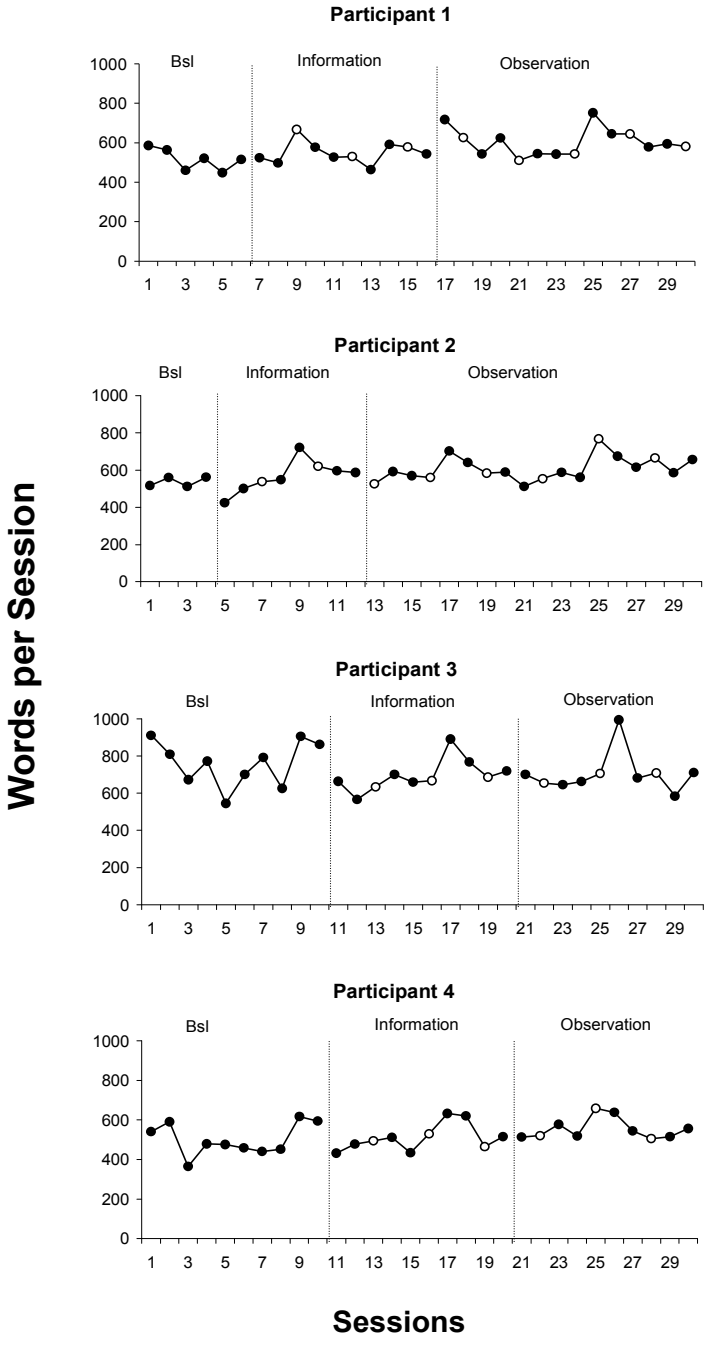


Figure 6 illustrates the data for participant 1 during one of the experimenter observation probe sessions (session 15) for each target response. A two-minute probe was conducted on every third session. Direct observations did not have any obvious effect on safety performance. All other graphs that display no changes in behavior in the time before the probes to during the probe or from during the probe to after the probes for all other participants look similar to Figure 6. Therefore Figure 6 will be included as a model for the other graphs that do not show an effect rather than including every graph that did not show an effect. During sessions 12, 21, and 24 there was a change in safety performance from the two minutes immediately before the probe to the two minutes during the probe for forearm position. Figure 7 depicts session 21. All graphs that display a change in safety performance from immediately before the probe to the two minutes during the probe look similar to Figure 7. Therefore Figure 7 will be included as a model for the other graphs that show a change in safety performance from immediately before the probe to the two minutes during the probe. During sessions 12, 18, 21, and 24 there was a change in performance from the two minutes during the probe to the two minutes after the probe for forearm position (Figure 8). There was also a change in performance after the probe for leg position during sessions 9 and 30 and for feet position during session 30. All graphs that display a change in safety performance from the two minutes during the probe to immediately after the probe look similar to Figure 8. Therefore Figure 8 will be included as a model for the other graphs that show a change in safety performance immediately after the probe.

Figure 6. Probe data for session 15 for Participant 1. The open circles indicate when the two-minute experimenter probes occurred.

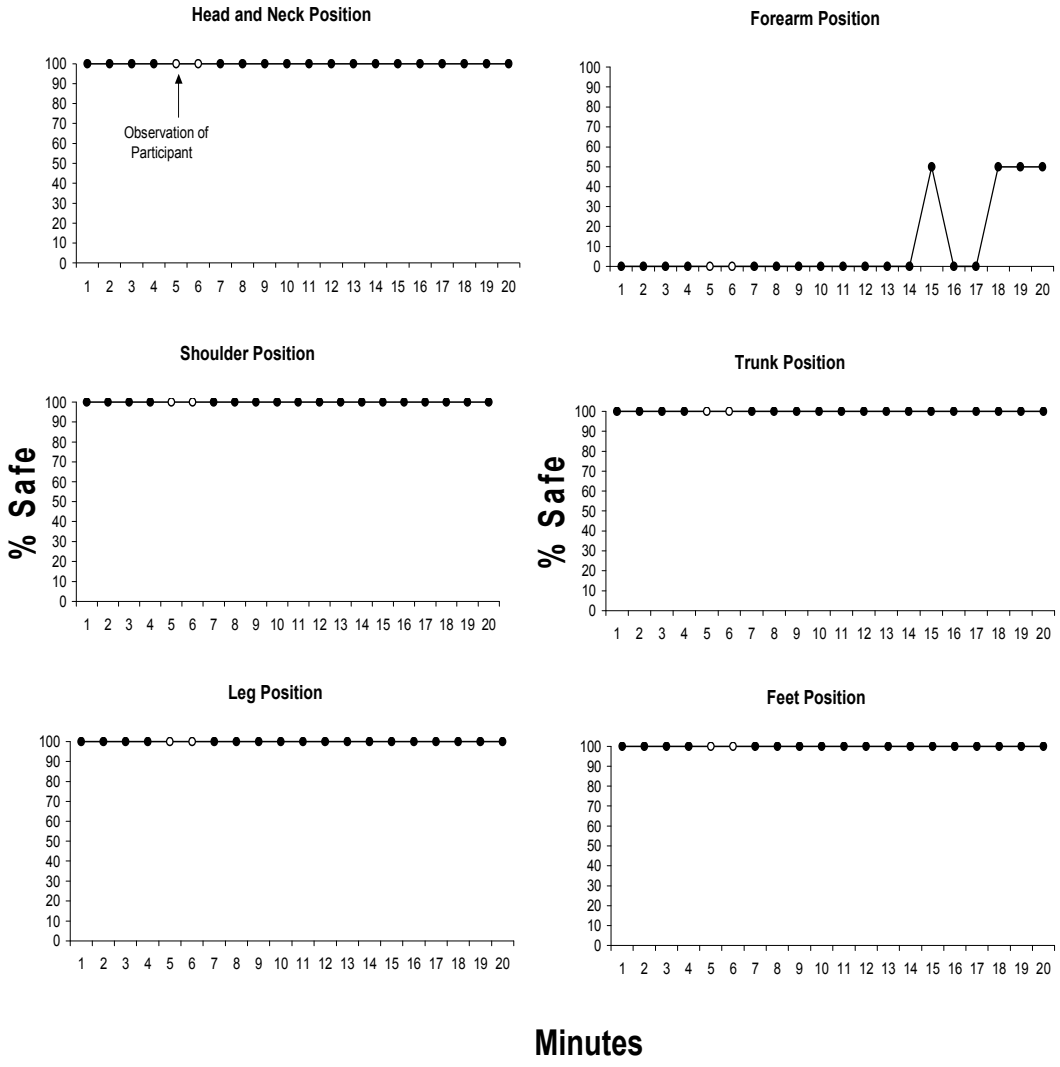


Figure 7. Probe data for session 21 for Participant 1. The open circles indicate when the two-minute experimenter probes occurred.

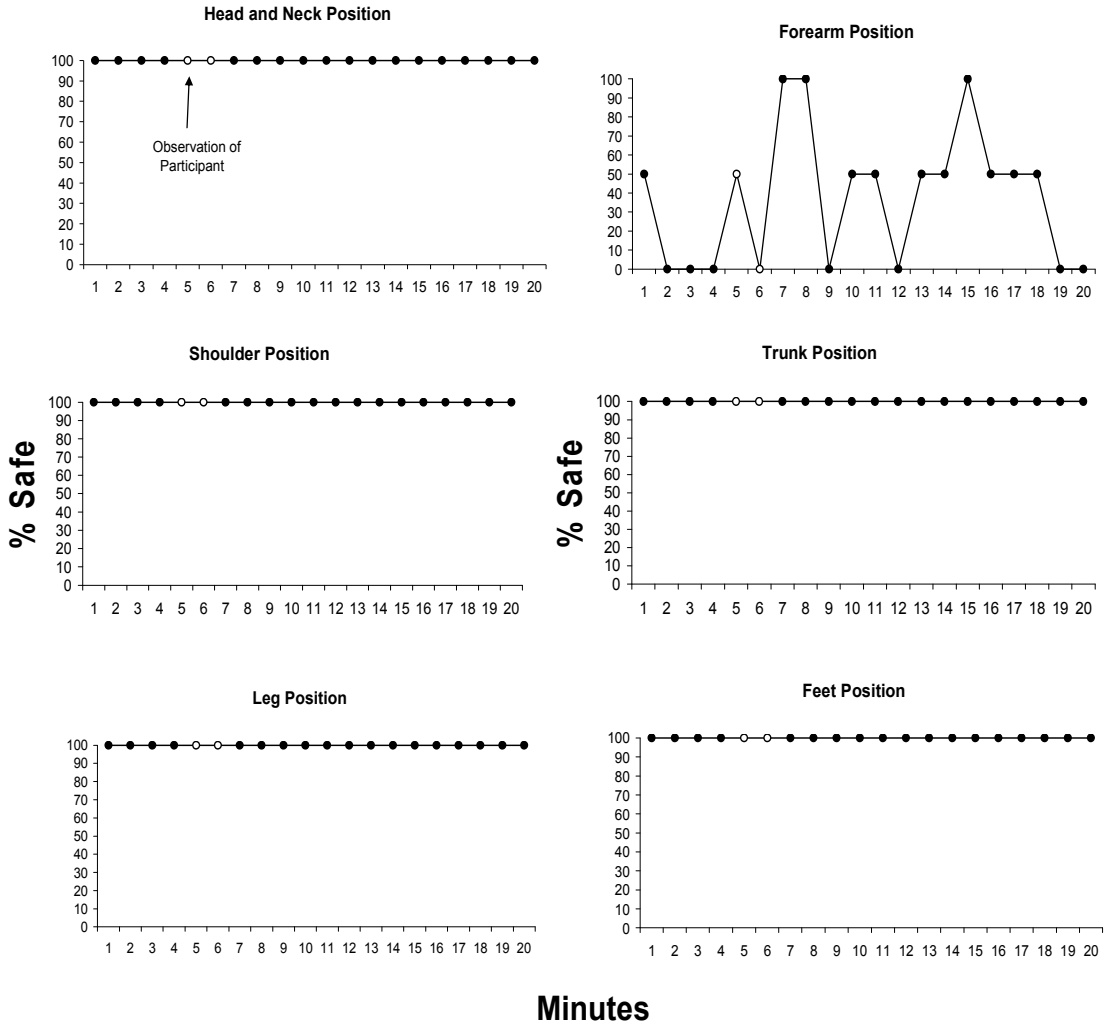
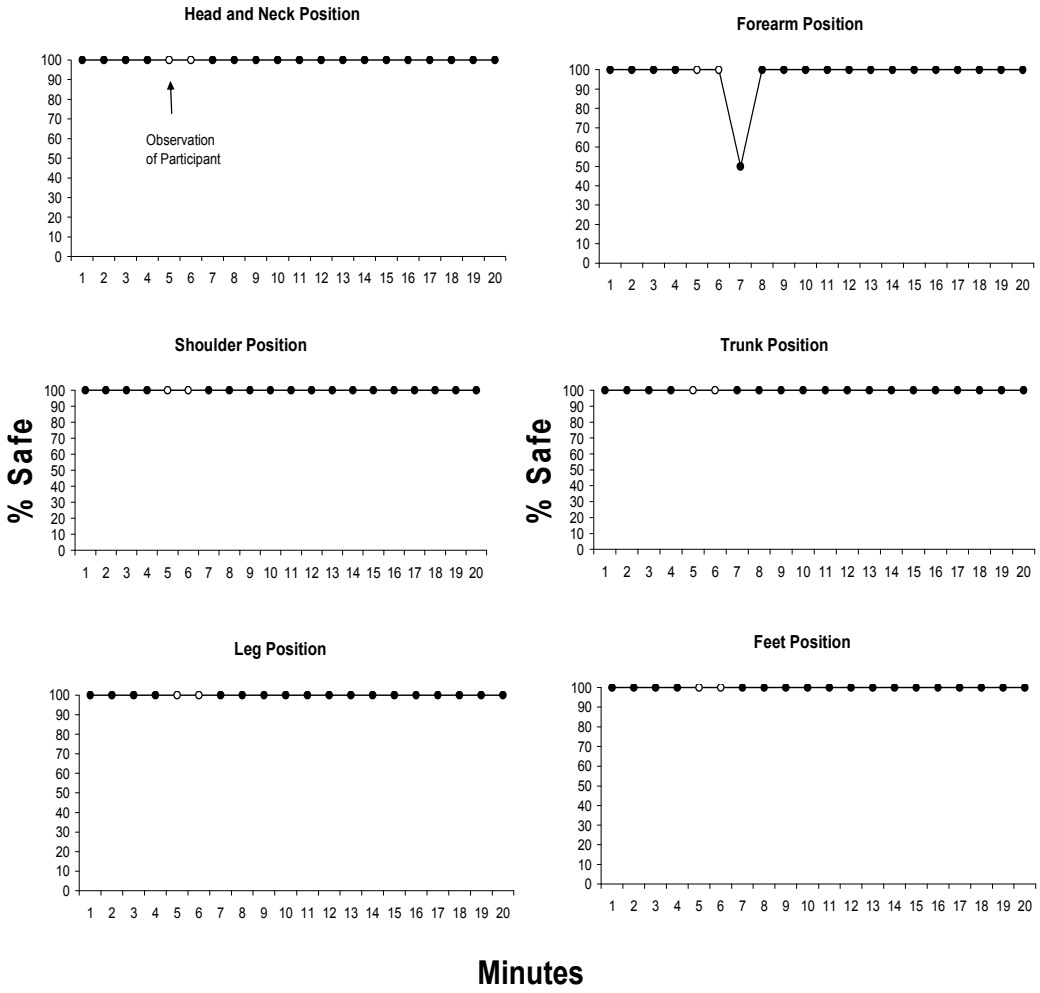


Figure 8. Probe data for session 18 for Participant 1. The open circles indicate when the two-minute experimenter probes occurred.



For participant 2 there was a change in safety performance between the two minutes leading up to the probe and the two minutes during the probe for the following sessions: 7 (forearm position), 10 (leg position), 19 (leg position), 22 (forearm position), and 25 (forearm position). There was a change in safety performance between the two minutes during the probe and the two minutes after the probe for sessions 7, 19, and 25 (forearm position) and session 28 (feet position).

For participant 3 there was a change in safety performance between the two minutes leading up to the probe and the two minutes during the probe for sessions 16 (forearm and leg positions), 22 (leg position), 25 (forearm and leg positions), and 28 (feet and leg positions). There was a change in safety performance between the two minutes during the probe and the two minutes after the probe for sessions 16 (forearm and leg positions), 25 (leg position), and 28 (feet and leg positions).

For participant 4 there was a change in safety performance between the two minutes leading up to the probe and the two minutes during the probe for sessions 16 (head and neck, shoulder, feet, and leg positions), 19 (trunk position), 22 (forearm, feet, and leg positions), and 25 (head and neck position and feet position). There was a change in safety performance between the two minutes during the probe and the two minutes after the probe for sessions 16 (forearm and shoulder positions), 19 (forearm and feet positions), 22 (forearm position), and 25 (head and neck position).

Tables 7 – 10 illustrate the average percent increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe and the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for all four participants.

Table 7. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 1. White spaces indicate baseline sessions, light gray spaces indicate information sessions and dark gray spaces indicate observation sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease.

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
9	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	+ 50%	0%	0%	0%
12	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	+ 50%
15	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
18	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	− 25%
21	before - during	0%	0%	0%	0%	0%	+ 25%
	during - after	0%	0%	0%	0%	0%	+ 75%
24	before - during	0%	0%	0%	0%	0%	− 50%
	during - after	0%	0%	0%	0%	0%	+ 50%
27	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
30	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	− 50%	− 50%	0%	0%

Table 8. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 2. White spaces indicate baseline sessions, light gray spaces indicate information sessions and dark gray spaces indicate observation sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease.

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
7	before - during	0%	0%	0%	0%	0%	+ 25%
	during - after	0%	0%	0%	0%	0%	− 25%
10	before - during	0%	0%	+ 100%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
13	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
16	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
19	before - during	0%	0%	+ 50%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	+ 50%
22	before - during	0%	0%	0%	0%	0%	+ 50%
	during - after	0%	0%	0%	0%	0%	0%
25	before - during	0%	0%	0%	0%	0%	− 50%
	during - after	0%	0%	0%	0%	0%	+ 75%
28	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%

Table 9. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 3. White spaces indicate baseline sessions, light gray spaces indicate information sessions and dark gray spaces indicate observation sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease.

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
13	before -during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
16	before - during	0%	0%	− 75%	0%	0%	− 50%
	during - after	0%	0%	− 25%	0%	0%	− 25%
19	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
22	before - during	0%	0%	− 25%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
25	before - during	0%	0%	− 50%	0%	0%	+ 50%
	during - after	0%	0%	+ 50%	0%	0%	0%
28	before - during	0%	0%	− 100%	− 25%	0%	0%
	during - after	0%	0%	+ 50%	+ 25%	0%	0%

Table 10. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 4. White spaces indicate baseline sessions, light gray spaces indicate information sessions and dark gray spaces indicate observation sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease.

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
13	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
16	before - during	− 50%	− 25%	− 50%	− 50%	0%	0%
	during - after	0%	+ 25%	0%	0%	0%	− 25%
19	before - during	0%	0%	0%	0%	− 25%	0%
	during - after	0%	0%	0%	+ 25%	0%	− 25%
22	before - during	0%	0%	+ 75%	+ 75%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%
25	before - during	+ 50%	0%	0%	− 50%	0%	0%
	during - after	+ 50%	0%	0%	0%	0%	0%
28	before - during	0%	0%	0%	0%	0%	0%
	during - after	0%	0%	0%	0%	0%	0%

Table 11 illustrates the percentage of probe sessions during each phase when a change in safety performance occurred for all four participants.

Table 11. Percentage of probe sessions during each phase when a change in safety performance occurred.

Participant		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
1	before - during increase (baseline)	N/A	N/A	N/A	0%	0%	17%
	before - during decrease (baseline)	N/A	N/A	N/A	0%	0%	17%
	before - during increase (information)	0%	0%	0%	N/A	N/A	N/A
	before - during decrease (information)	0%	0%	0%	N/A	N/A	N/A
	before - during increase (observation)	0%	0%	0%	0%	0%	0%
	before - during decrease (observation)	0%	0%	0%	0%	0%	0%
	during - after increase (baseline)	N/A	N/A	N/A	0%	0%	50%
	during - after decrease (baseline)	N/A	N/A	N/A	0%	0%	17%
	during - after increase (information)	0%	0%	33%	N/A	N/A	N/A
	during - after decrease (information)	0%	0%	0%	N/A	N/A	N/A
	during - after increase (observation)	0%	0%	0%	0%	0%	0%
	during - after decrease (observation)	0%	0%	20%	50%	0%	0%
2	before - during increase (baseline)	N/A	N/A	N/A	0%	0%	20%
	before - during decrease (baseline)	N/A	N/A	N/A	0%	0%	0%
	before - during increase (information)	0%	0%	50%	N/A	N/A	N/A
	before - during decrease (information)	0%	0%	0%	N/A	N/A	N/A
	before - during increase (observation)	0%	0%	17%	0%	0%	0%
	before - during decrease (observation)	0%	0%	0%	0%	0%	67%
	during - after increase (baseline)	N/A	N/A	N/A	0%	0%	20%
	during - after decrease (baseline)	N/A	N/A	N/A	0%	0%	20%
	during - after increase (information)	0%	0%	0%	N/A	N/A	N/A
	during - after decrease (information)	0%	0%	0%	N/A	N/A	N/A
	during - after increase (observation)	0%	0%	0%	0%	0%	33%
	during - after decrease (observation)	0%	0%	0%	0%	0%	0%
3	before - during increase (baseline)	0%	0%	0%	N/A	N/A	N/A
	before - during decrease (baseline)	0%	0%	60%	N/A	N/A	N/A
	before - during increase (information)	N/A	N/A	N/A	0%	0%	0%
	before - during decrease (information)	N/A	N/A	N/A	0%	0%	33%
	before - during increase (observation)	0%	0%	0%	0%	0%	33%
	before - during decrease (observation)	0%	0%	100%	33%	0%	0%
	during - after increase (baseline)	0%	0%	20%	N/A	N/A	N/A
	during - after decrease (baseline)	0%	0%	20%	N/A	N/A	N/A
	during - after increase (information)	N/A	N/A	N/A	0%	0%	0%
	during - after decrease (information)	N/A	N/A	N/A	0%	0%	33%
	during - after increase (observation)	0%	0%	100%	33%	0%	0%
	during - after decrease (observation)	0%	0%	0%	0%	0%	0%
4	before - during increase (baseline)	0%	0%	25%	N/A	N/A	N/A
	before - during decrease (baseline)	25%	N/A	25%	N/A	N/A	N/A
	before - during increase (information)	N/A	N/A	N/A	0%	0%	0%
	before - during decrease (information)	N/A	N/A	N/A	33%	33%	0%
	before - during increase (observation)	50%	0%	0%	33%	0%	0%
	before - during decrease (observation)	0%	0%	0%	33%	0%	0%
	during - after increase (baseline)	0%	25%	0%	N/A	N/A	N/A
	during - after decrease (baseline)	0%	0%	0%	N/A	N/A	N/A
	during - after increase (information)	N/A	N/A	N/A	33%	0%	0%
	during - after decrease (information)	N/A	N/A	N/A	0%	0%	67%
	during - after increase (observation)	50%	0%	0%	0%	0%	0%
	during - after decrease (observation)	0%	0%	0%	0%	0%	0%

Interobserver Agreement

Table 12 displays the interobserver agreement (IOA) data. IOA was collected on 42% of all sessions (50 out of 120 sessions). IOA fell below 90% at one point during Experiment 1 so the research assistants scoring the videos were re-trained and the session where IOA fell below 90% was re-scored.

Table 12. IOA for Experiment 1.

	All Target Responses	Head and Neck Position	Trunk Position	Shoulder Position	Forearm Position	Leg Position	Feet Position
Average	97%	99%	94%	99%	91%	97%	100%
Standard Deviation	3.2	1.1	3.8	1.2	1.3	3.5	0.4
Range	92% - 100%	97% - 100%	90% - 100%	96% - 100%	90% - 96%	90% - 100%	97% - 100%

Discussion

The purpose of the present study was to expand on the design of the existing safety observer effect literature. More specifically, the current study expanded upon the Alvero and Austin (2004) study which demonstrated that conducting safety observations improved the safety performance of the observers. The primary goal of Experiment 1 was to determine if the observer effect existed when the observer was unaware that their performance was being observed. Additionally, the current study was an attempt to assess whether or not a correlation existed between the accuracy of participant scoring and the safety of participant behavior. The analysis of correlations was based on the work of Sasson and Austin (2005). Furthermore, the effects of being directly observed by the experimenter were compared with the effects of not knowingly being observed by anyone. Lastly, the number of words typed per session by the participants was recorded to ensure that engaging in safe typing behavior did not impede the productivity of the participants. The data suggest that engaging in safe typing behavior does not impede an individual's ability to maintain their usual speed of typing.

The results of the current study suggest that conducting observations and collecting data on those observations do not result in improvements in safety performance. Experiment 1 did not obtain the same results as the Alvero and Austin (2004) study. With the exception of leg position for participants 1 and 2 and feet position for participant 3, there were no substantial improvements in safety behavior for any of the participants. Due to a ceiling effect for head and neck position and shoulder position for participant 2, any improvements that may have occurred were masked. Additionally, the increase in safety performance for feet position for participant 2 did not appear to be

dependent on the start of any sort of intervention. Rather, the increase in safety performance for feet position occurred during baseline and coincided with the start of the information phase for head and neck, shoulder, and leg positions. Increases for safety performance for head and neck position and shoulder position for participant 3 occurred during baseline and coincided with the start of the information phase for forearm, trunk, and feet.

Effects of Conducting Observations

Conducting observations and collecting data on those observations rarely resulted in a positive change in safe typing behavior. It is possible that conducting observations did not have a strong effect on the safety performance of the participants because the participants were unaware they were being observed by the experimenter. The participants in the Alvero and Austin (2004) and Sasson and Austin (2005) studies were aware that the experimenters were observing them. The knowledge of being watched by the experimenters may have been partially responsible for the increase in safe behavior. Over the course of the current study, the only participants'/target responses in which a positive change occurred were with participants 1 and 2 (leg position) and participant 3 (feet position). There was no change in behavior for head and neck and shoulder position for participants 1 and 2 due to a ceiling effect during baseline. There was a decrease in safe typing behavior during the observation phase for forearm position for participant 1, trunk position for participants 2 and 3, and forearm, trunk, feet, legs, and head and neck position for participant 4.

Effects of Reactivity

One reason for the differing results between the current study and the Alvero and Austin (2004) study may be that the participants in the Alvero and Austin (2004) study were aware that their performance was being recorded with a video camera. The participants in the current study were not informed that their performance was being recorded until they were debriefed at the end of the study. It is possible to speculate that the results of the Alvero and Austin (2004) study were due to reactivity combined with the effects of conducting observations. If the participants in the current study were aware that their performance was being observed by the experimenter for the duration of each session (as with the Alvero and Austin 2004 study) it is possible that conducting observations may have had a stronger positive effect on participant behavior. It is possible that having the experimenter observe the participant for only two minutes once every three sessions was simply not enough to see any reactivity.

Effects of Information

Receiving information about ergonomically safe typing posture had little or no positive effect on most target responses for which participants were given information. For participant 1, receiving information resulted in an increase in safety behavior for leg position and for participant 3 receiving information resulted in an increase in safety behavior for trunk position. There was a ceiling effect for head and neck position for participants 1 and 2. Finally, for participant 4, receiving information resulted in a decrease in safe behavior for all three positions that she was given information on (forearm, trunk, and feet positions). Nonetheless, many of the target responses that participants were not given information on increased when information was distributed

regarding the other responses. This can be seen in the fact that participant 1 received information about head and neck, shoulder, and leg positions but that information preceded a baseline shift for forearm, trunk, and feet positions. For participant 2, receiving information about head and neck, shoulder, and leg positions resulted in a baseline shift for forearm, trunk, and feet positions. For participant 3, receiving information about forearm, trunk, and feet positions resulted in a baseline shift for leg, head and neck, and shoulder positions. Finally, for participant 4, receiving information about forearm, trunk, and feet position resulted in a baseline shift for shoulder position.

Based on these results one can speculate that receiving information on ergonomically safe typing posture does not result in any consistent change of behavior. Despite this, it does appear apparent that some of the target behaviors covaried with each other. It is possible that the covariation of target behaviors was due to inadvertent multiple exemplar training. In other words, when participants received information on one group of behaviors, this "safety" information may have generalized to the other group of behaviors (Ludwig and Geller, 1991). In the future, researchers should try to determine whether multiple exemplar training was responsible for the covariation of target behaviors.

Correlation Between Accuracy and Safety

One of the secondary variables of Experiment 1 was the correlation between accuracy of scoring and safety performance. It was anticipated that there would be a correlation between the accuracy of scoring and safety performance for the participants in Experiment 1 as there was in the Sasson and Austin (2005) study. No correlation was found between the accuracy of scoring and safety performance in the current study. The

failure to find a correlation may have been due to the fact that it was usually easier for participants to discriminate between safe and unsafe behavior on the confederate than it was for them to discriminate between their own safe and unsafe behavior. For the most part, the only time the safety behavior of the participants was higher than their accuracy of scoring was when there was a ceiling effect for safety performance.

Effects of Experimenter Probes

Another secondary goal of Experiment 1 was to examine the effect of two-minute experimenter probes on the safe typing behavior of the participants. It was anticipated that participants would improve their safety performance if they were aware that their performance was being monitored by an authority figure (the experimenter). In fact, there were no substantial or consistent changes in the safety performance of the participants during the two-minute probes. Based on exit interviews, it was discovered that the participants did not regard the experimenter as an authority figure so they had no incentive to change their behavior from unsafe to safe while being observed by the experimenter. Participants also stated that they knew they would be paid simply for showing up, scoring videos, and typing the documents given to them by the experimenter. Regardless of whether they performed safely or unsafely they were paid nonetheless. Therefore there was no need for them to exert any effort and sit in a safe position. They could sit in a comfortable, unsafe position and still earn the same money they would earn by sitting in an uncomfortable, safe position. Based on exit interviews it was discovered that most participants were more comfortable sitting in an unsafe position than a safe position.

Words Typed Per Session

The final secondary dependent variable in Experiment 1 was the number of words typed per session. If typing in a safe manner resulted in impairing the ability of the participants to type then the intervention would not be suitable for a "real world" application. Companies will not want to implement changes that increase safety performance if those same changes result in a decrease in productivity.

For some participants in Experiment 1, some target responses became safer while for other participants, some target responses became less safe. Regardless of whether or not the safety performance of the participants increased or decreased, the words typed per session did not vary along with the safety performance of the participants. Therefore one can conclude that increases in safety performance do not result in decreases in productivity.

Strengths and Weaknesses of the Study

One strength of Experiment 1 is that it eliminated the possible extraneous variable of combining the observer effect with reactivity seen in the Alvero and Austin (2004) and Sasson and Austin (2005) studies. Eliminating the combination of the observer effect and reactivity was achieved by using hidden cameras rather than cameras that were placed out in the open. In this regard, the current study does not have to account for participants who may have been performing in a safe manner simply to please the experimenter, otherwise known as "demand characteristics" (Kazdin, 1992). It is also possible that the participants in the Alvero and Austin (2004) and Sasson and Austin (2005) studies improved their performance throughout the course of the studies because they were following self-generated rules that described indirect-acting avoidance contingencies

(Malott, 1992) such as, “if I engage in ergonomically safe posture the experimenter will not become angry with me.” It is possible that the participants in the Alvero and Austin (2004) and Sasson and Austin (2005) studies were more likely to create these “rules” for themselves than the participants in the current study because the participants in the above-mentioned studies were aware that they were being observed by the experimenters for the duration of every session they participated in.

The two-minute experimenter probes were conducted to examine if reactivity combined with the observer effect had any effect on the safety performance of participants. If safety performance dramatically increased in the presence of the experimenter as compared to times when the experimenter was not present it would be a clear indication of reactivity combined with the observer effect. There was no change in performance during the two-minute experimenter probes but that may be because in order to see an effect from the presence of the experimenter, the experimenter must observe the participants for the duration of every session. The lack of any change in performance may also be due to the fact that there were no positive contingencies in place for behaving in a safe manner.

Another strength of the study is that it was conducted in a laboratory setting so as to eliminate as many extraneous variables as possible. Conversely, the fact that the study was conducted in a laboratory setting may also be seen as a weakness of the study because the findings of this study may not generalize to a real-world setting.

An additional weakness of the study was the fact that experimenter probes were not conducted during the baseline phase.

Another weakness of the study was the lack of any consequences for safe or unsafe performance. Regardless of participant performance, the consequence was always the same - $5 per half hour session. Therefore one can assume that there was no incentive for participants to behave in a safe manner. Rather, the incentive was to perform in an unsafe manner because it was more comfortable than sitting with safe posture.

A final weakness of the study was the lack of feedback given to the participants. During the exit interviews some participants stated that they were unaware they were typing in an unsafe manner. They went on to say that if they had been given feedback on their performance, it would have helped teach them when they were sitting safely and when they were sitting unsafely. This knowledge would have enabled them to monitor their posture more efficiently.

Implications for Experiment 2

During the exit interviews two participants stated that feedback on their posture would have helped them perform in a safer manner. In light of these statements, during Experiment 2 the experimenter provided feedback on the safety performance of the participants in order to ensure that participants were aware of what was expected of them.

Additionally, in Experiment 2 all participants were required to work with a confederate in the room to see if the presence of a person other than the experimenter would result in an increase in safety performance. The rationale for having a confederate in the room is based upon the effects of reactivity that may be at least partially responsible for the results obtained by Alvero and Austin (2004) and Sasson and Austin (2005). Although the possible reactivity effects in the Alvero and Austin (2004) and

Sasson and Austin (2005) studies were due to continuous observation by the experimenter, the presence of another person in the room with the participant may also bring about a change in safety behavior. It may be possible that participants are more likely to engage in safe typing behavior if someone is in the room with them while they are typing. The confederate was also observed by the experimenter during the two-minute probes in Experiment 2 to see if these "indirect" observations had any effect on the safety performance of the participants.

The methods of Experiment 2 were designed to provide participants with the opportunity to earn reinforcement for engaging in safe typing behavior. Reinforcement was implemented to ensure that participants earn more for sitting in a safe rather than an unsafe position. During Experiment 2, the experimenter also provided feedback on the safety performance of the participants to ensure that participants were aware of what was expected of them. Additionally, Experiment 2 required all participants to work with a confederate in the room to see if the presence of a person other than the experimenter for the duration of the study resulted in an increase in safety performance.

Experiment 2

Experiment 2 examined if the change in safety behavior was affected by direct or indirect observation by the experimenter. It also examined if safety behavior was affected by feedback and the offer of reinforcement. All participants worked with a peer confederate in the room. Indirect observation occurred when the experimenter observed and collected data on the behavior of the peer confederate but not the behavior of the participant. The indirect observations were announced as in Experiment 1 but in Experiment 2 the experimenter specifically told the participant that the experimenter was going to be observing the behavior of the participant. The participant was told that the experimenter would be observing the three responses on which the participant was being given information. In the last phase of Experiment 2, the experimenter offered the participants reinforcement if they were engaging in safe typing behavior. The experimenter told the participants that they could leave 10 minutes early if and only if they were engaging in all target responses while the experimenter observed them (during the probes). If the participants did not engage in the target responses, they did not get to leave after typing for 10 minutes. Rather, they had to stay for the usual 20 minute duration of the typing session. Additionally, after completion of the session the experimenter gave the participants feedback about why they did not get to leave early. The number of participants, prerequisite skills, tasks, target responses, and experimental design in Experiment 2 were identical to those in Experiment 1. The secondary variables of Experiment 2 were the same as those of Experiment 1 with the exception of "indirect observations" being examined in Experiment 2 as well as measuring "words per minute" rather than "words per session." The reason words per minute were measured rather than

words per session is because if and when participants earned reinforcement and were able to leave after typing for 10 rather than 20 minutes, the words per session would have been less for the sessions when they earned reinforcement. Therefore the rate of typing rather than the total number of words typed was recorded. The phases in Experiment 2 were slightly different from those in Experiment 1. As in Experiment 1, the first phase was the baseline phase. The second phase of Experiment 2 was the observation phase and the third phase of Experiment 2 was the reinforcement and feedback phase. The exit interview in Experiment 2 was slightly different than the exit interview used for Experiment 1 (see Appendix O). The four participants in Experiment 2 were four different undergraduates from those who took part in Experiment 1.

Method

Participants & Setting

Participants were four undergraduate students who attended a northeastern university. The ability to touch type, or type with both hands on the keyboard without having to look at the keyboard, was a prerequisite skill (refer to *participant recruitment and informed consent* subheading on page 14 for details). Participants were paid $10 per hour ($5.00 per half hour session). The setting was a university laboratory that had been designed to resemble an office setting. The simulated office environment consisted of three rooms: one observation room, one monitoring room, and one typing room.

Procedure

All sessions were recorded via a hidden video camera. Unlike in Experiment 1, participants were given information on three of the six target responses at the beginning of the first baseline session. Participants were required to demonstrate the correct as well

as the incorrect way of engaging in the three target responses during the first session of the baseline phase.

During the second (observation) phase of Experiment 2 the participant conducted observations of a confederate video and collected data on those observations for the three target responses they were given information on during the baseline phase (see Appendices H and I for scripts that were used). After the participant finished collecting data on their observations they went into another room and typed for 20 minutes. Probes were conducted every three sessions during this phase; and while the experimenter was observing the participant or the confederate, the experimenter told the participant or the confederate that she was observing whether or not they were engaging in the three responses they were given information on. The experimenter reminded the participant or confederate what those three responses were every time a two-minute observation probe was conducted. The experimenter alternated between observing the participant and the peer confederate every three sessions. For example, if the experimenter observed the participant during session 9, the experimenter observed the peer confederate during session 12. The participant was then observed again during session 15 and the peer confederate was observed again during session 18. Therefore, the participants in the peer condition were observed every six sessions. As in Experiment 1, the experimenter observed the participant or the peer confederate for two minutes. In Experiment 2 the experimenter told the participant exactly what the experimenter was observing. For example, if the experimenter was going to be observing the participant, the experimenter would point to the participant and say, “I’m going to collect data on your typing behavior for a couple of minutes. I’m going to be observing the three responses you were given

information on when you first started the experiment. Those three responses are ….” If the experimenter was observing the peer confederate, the experimenter made the same statement but pointed to the peer confederate instead. These two-minute observation periods were conducted only during the second (observation) and third (reinforcement and feedback) phases.

The third (reinforcement and feedback) phase of Experiment 2 was similar to the second phase of Experiment 2 with the exception of reinforcement and feedback offered to the participant and confederate. The first session in the third phase was always a probe session for the participant even if the “pattern” of conducting probe sessions once every three sessions had to be broken. The reason for this was to ensure that the participant received the information regarding the offer of reinforcement for engaging in the target responses. The experimenter told the participant and the confederate that if they were engaging in all three target responses they were given information on they could leave ten minutes early but still be paid for the entire session. The experimenter also informed the participant and confederate that if they did not engage in all three target responses they were given information on they would have to stay for the usual duration of the session. Additionally, after completion of the session, the experimenter pulled the participant aside if they did not get to leave early and gave them feedback about why they did not get to leave early. For example, if the participant was supposed to be sitting with both feet flat on the floor but did not do so during the session, the experimenter said, “You did not get to leave early because your feet were not in the correct position.” Once the three target responses of the participant stabilized in phase three, the participant and the confederate were given data sheets with all six target responses listed. The participant

and confederate were required to collect data on all six target responses while they were observing the confederate videos. The pattern of conducting probes every three sessions could be broken when introducing the last three target behaviors. The experimenter did not explicitly review the additional three target responses the way she did with the first three target responses. The experimenter simply told the participant and the confederate that they would now be collecting data on the original three target responses with the addition of three new target responses for a total of six target responses. The experimenter also told the participant and confederate that they were required to engage in all six target responses during the two-minute probes in order to leave 10 minutes early. The order in which the confederates behaved in a safe and unsafe manner was counterbalanced. For participants 1a and 3a the confederate engaged in unsafe behavior the first time they were observed by the experimenter but engaged in safe behavior the second time they were observed by the experimenter, and unsafe behavior the third time they were observed by the experimenter, and so on. For participants 2a and 4a the confederate was safe the first time they were observed by the experimenter but unsafe the second time they were observed by the experimenter and so on and so forth. All other aspects of the procedure were identical to those of Experiment 1.

Results

The safety performance of three of the four participants (participants 1a, 2a, and 3a) increased consistently after conducting observations and collecting data during those observations along with the offer of reinforcement and feedback (phase 3). Figure 9 displays the safety performance and accuracy of scoring data for participant 1a. The data are summarized in Table 13. The numbers indicate the median scores as well as the mean percentage of time participant 1a engaged in safe typing behavior for each target response. There was an increase in safety performance for all six target responses. Nevertheless, for feet position, most of the scores from session 11 until the beginning of the reinforcement and feedback phase (session 29) were at or near 100% safe so comparing the mean scores of 76% and 100% does not give a clear description of the differences between phases.

Table 13. Median scores and mean percentage of time participant 1a engaged in safe typing behavior for each target response.

	Head and Neck Position	Shoulder Position	Leg Position	Forearm Position	Trunk Position	Feet Position
Baseline (Mean)	71%	83%	47%	22%	41%	76%
Baseline (Median)	76.5%	93.5%	38%	2%	38%	100%
Observation (Mean)	73%	87%	38%	N/A	N/A	N/A
Observation (Median)	74%	100%	0%	N/A	N/A	N/A
Observation with Reinforcement and Feedback (Mean)	96%	100%	98%	80%	80%	100%
Observation with Reinforcement and Feedback (Median)	100%	100%	100%	100%	100%	100%

Figure 9. Safety data and accuracy of scoring with mean lines across phases for Participant 1a. The open circles indicate sessions in which the experimenter observed the participant and the open triangles indicate sessions in which the experimenter observed the confederate. The closed triangles indicate the accuracy of scoring for Participant 1a.

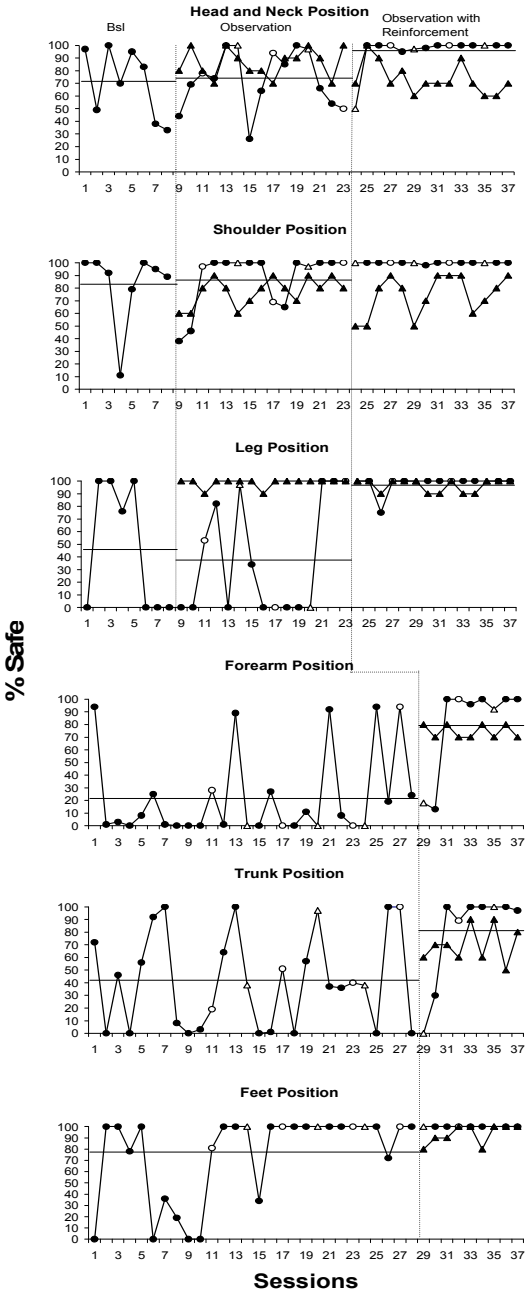


Figure 10 displays the safety performance and accuracy of scoring data for participant 2a. The data are summarized in Table 14. The numbers indicate the median scores and the mean percentage of time participant 2a engaged in safe typing behavior for each target response.

Table 14. Median scores and mean percentage of time participant 2a engaged in safe typing behavior for each target response.

	Forearm Position	Trunk Position	Feet Position	Head and Neck Position	Shoulder Position	Leg Position
Baseline (Mean)	53%	35%	53%	86%	99%	21%
Baseline (Median)	67.5%	16.5%	58%	95%	100%	0%
Observation (Mean)	66%	93%	96%	N/A	N/A	N/A
Observation (Median)	79%	100%	100%	N/A	N/A	N/A
Observation with Reinforcement and Feedback (Mean)	85%	97%	100%	99%	100%	96%
Observation with Reinforcement and Feedback (Median)	97%	100%	100%	99%	100%	99%

Figure 10. Safety data and accuracy of scoring with mean lines across phases for Participant 2a. The open circles indicate sessions in which the experimenter observed the participant and the open triangles indicate sessions in which the experimenter observed the confederate. The closed triangles indicate the accuracy of scoring for Participant 2a.

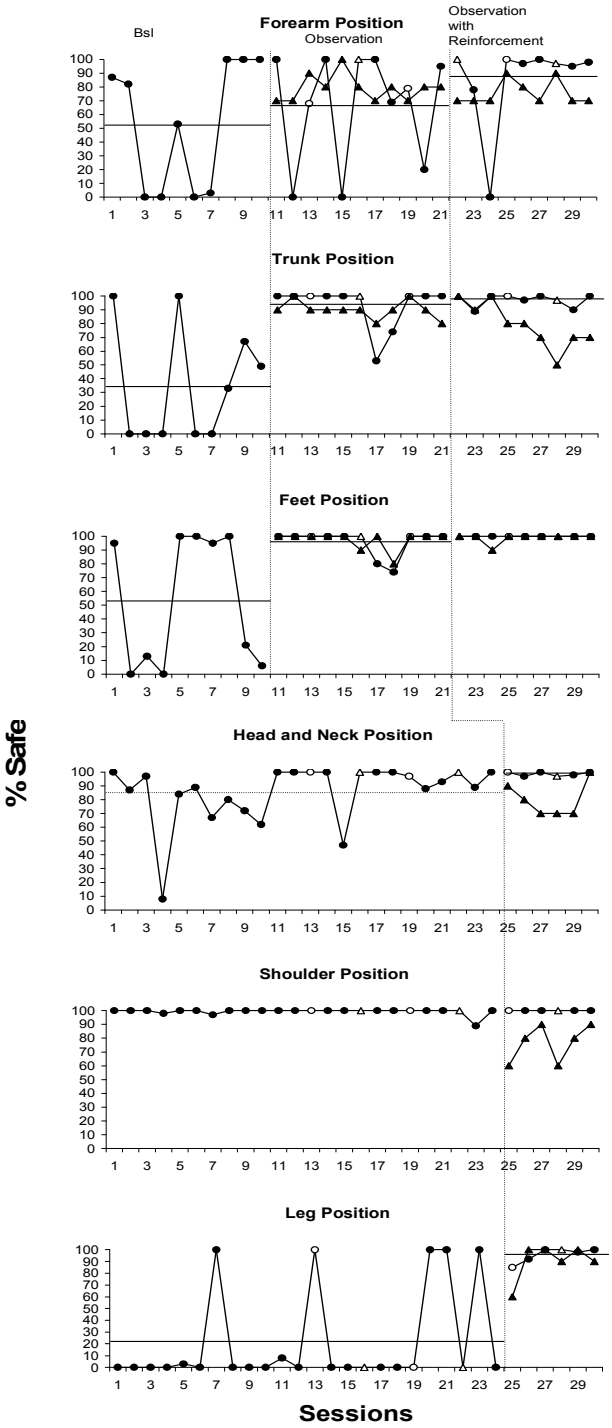


Figure 11 displays the safety performance and accuracy of scoring data for participant 3a. The data are summarized in Table 15. The numbers indicate the median scores as well as the mean percentage of time participant 3a engaged in safe typing behavior for each target response. Because there was a baseline shift for the forearm and trunk positions that coincided with the introduction of the observation phase for head and neck, shoulder, and leg positions, the baseline data for forearm and trunk positions are broken into “pre” and “post” baseline shift.

Table 15. Median scores and mean percentage of time participant 3a engaged in safe typing behavior for each target response.

	Head and Neck Position	Shoulder Position	Leg Position	Forearm Position	Trunk Position	Feet Position
Pre-Baseline Shift (Mean)	72%	73%	4%	52%	0%	94%
Pre-Baseline Shift (Median)	72%	100%	0%	48%	0%	100%
Post-Baseline Shift (Mean)	N/A	N/A	N/A	97%	100%	N/A
Post-Baseline Shift (Median)	N/A	N/A	N/A	100%	100%	N/A
Observation (Mean)	100%	100%	12%	N/A	N/A	N/A
Observation (Median)	100%	100%	0%	N/A	N/A	100%
Observation with Reinforecment and Feedback (Mean)	100%	100%	74%	100%	100%	100%
Observation with Reinforecment and Feedback (Median)	100%	100%	100%	100%	100%	100%

Figure 11. Safety data and accuracy of scoring with mean lines across phases for Participant 3a. The two lines in the baseline phase for forearm and trunk positions indicate where a baseline shift occurred. The open circles indicate sessions in which the experimenter observed the participant and the open triangles indicate sessions in which the experimenter observed the confederate. The closed triangles indicate the accuracy of scoring for Participant 3a.

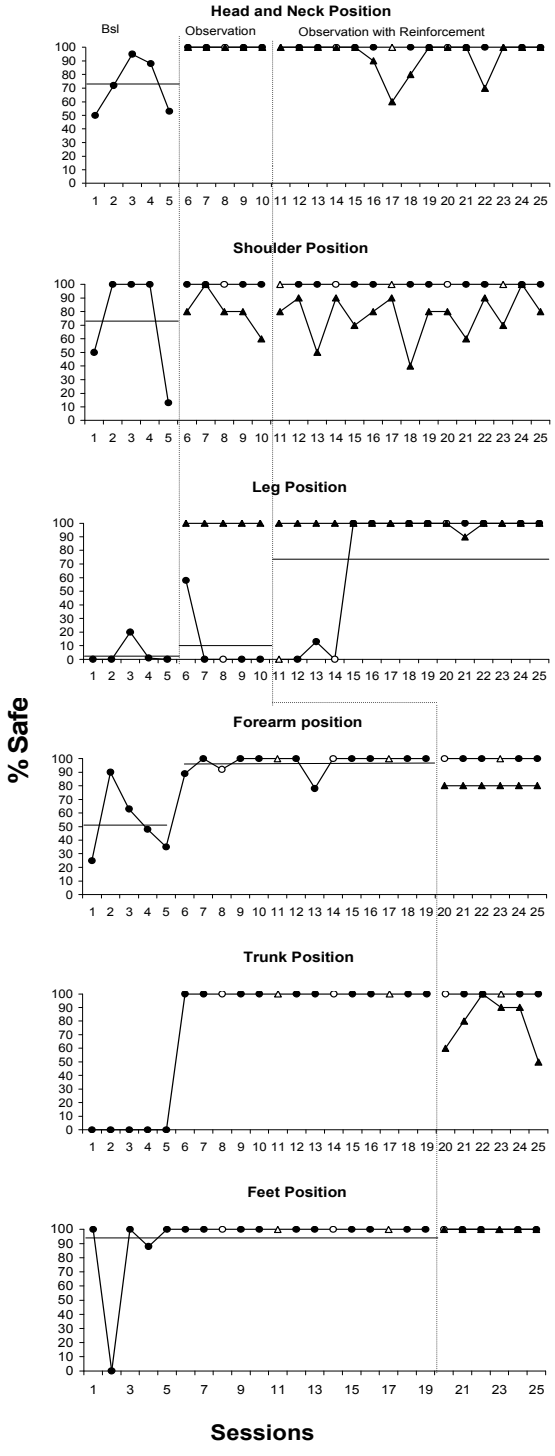
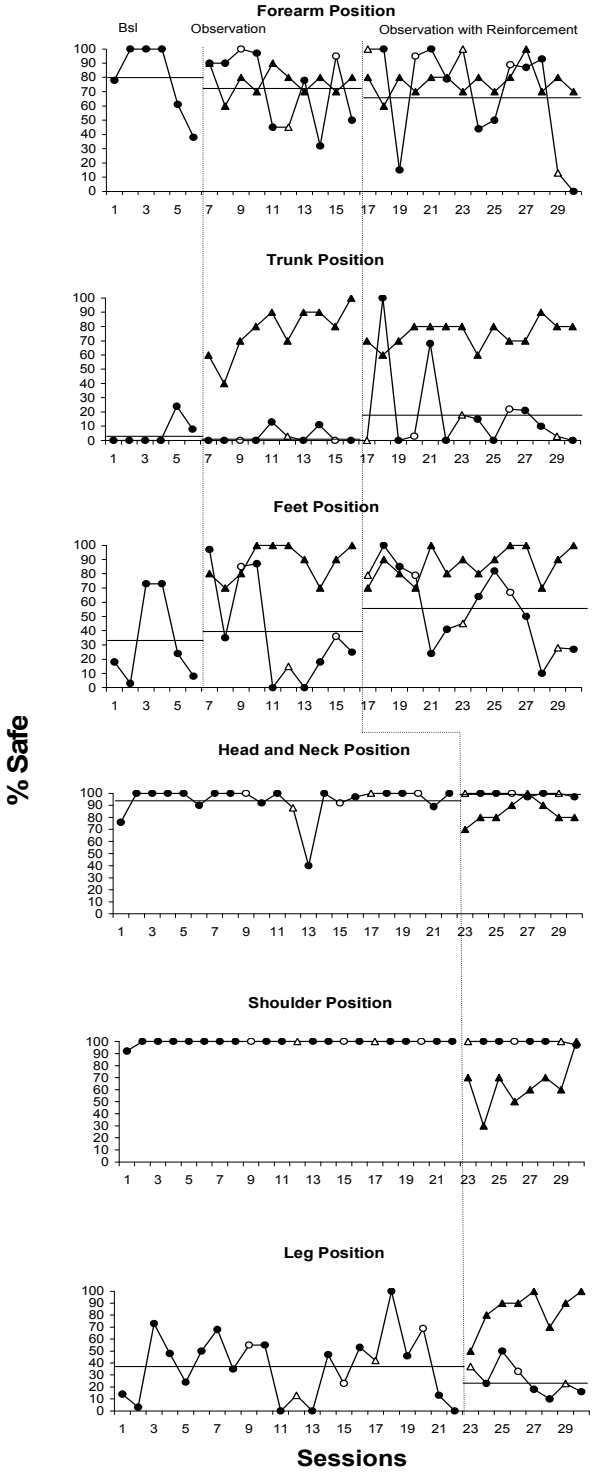


Figure 12 displays the safety performance and accuracy of scoring data for participant 4a. The data are summarized in Table 16. The numbers indicate the median scores as well as the mean percentage of time participant 4a engaged in safe typing behavior for each target response.

Table 16. Median scores and mean percentage of time participant 4a engaged in safe typing behavior for each target response.

	Forearm Position	Trunk Position	Feet Position	Head and Neck Position	Shoulder Position	Leg Position
Baseline (Mean)	80%	5%	33%	94%	100%	38%
Baseline (Median)	89%	0%	21%	100%	100%	44%
Observation (Mean)	72%	3%	40%	N/A	N/A	N/A
Observation (Median)	84%	0%	15%	N/A	N/A	N/A
Observation with Reinforcement and Feedback (Mean)	69%	19%	56%	99%	100%	26%
Observation with Reinforcement and Feedback (Median)	88%	6.50%	57%	100%	100%	23%

Figure 12. Safety data and accuracy of scoring with mean lines across phases for Participant 4a. The open circles indicate sessions in which the experimenter observed the participant and the open triangles indicate sessions in which the experimenter observed the confederate. The closed triangles indicate the accuracy of scoring for Participant 4a.



It was also found that the participant's accuracy of scoring the DVDs of the confederate at the beginning of one session did not increase along with their safety behavior later on during the same session. A Pearson r correlation was calculated to determine if there was a correlation between the accuracy of scoring and the safety performance of the participants at the .05 alpha level. Five correlations were calculated for participants 1a and 2a, one correlation was calculated for participant 3a, and six correlations were calculated for participant 4a. The mean correlations for each of the participants are as follows: participant 1a (-.11), participant 2a (.27), participant 3a (-.20), and participant 4a (-.07). The difference in number of correlations calculated for each participant is due to the fact that correlations were not always able to be calculated due to ceiling effects where all accuracy of scoring or safety scores were 100%. There were 24 opportunities to calculate a correlation but only 17 correlations were able to be calculated due to ceiling effects. Of the 17 correlations that were calculated, eight were positive and nine were negative. The accuracy of scoring at the beginning of one session did not correlate with the safety behavior of the participant later on during the same session. The only exception to this occurred with the leg position of participant 2a. There was a perfect correlation of $r = 1$ ($df = 3$). The correlations are based on the number of sessions that each participant took part in that consisted of watching and collecting data on the confederate in the DVD as well as typing. Therefore, the degrees of freedom are smaller for some target responses than for other target responses since participants collected data on some target responses before collecting data on other target responses. The degrees of freedom for each participant and each target response are listed in table 17.

Table 17. Degrees of freedom for correlations calculated between accuracy of scoring at the beginning of each session and safety behavior later on during the same session for each participant. Numbers in the table indicate the degrees of freedom. N/A indicates no correlation was able to be calculated due to a ceiling effect where all scores for safety behavior or accuracy of scoring were 100%

	Head and Neck Position	Shoulder Position	Leg Position	Forearm Position	Trunk Position	Feet Position
Participant 1a	26	26	26	6	6	N/A
Participant 2a	3	N/A	3	17	17	17
Participant 3a	N/A	N/A	18	N/A	N/A	N/A
Participant 4a	5	5	5	21	21	21

Additionally, there was no correlation between the safety performance of the participants on one session and the participant's accuracy of scoring the DVD of the confederate on the following session. A Pearson r correlation was calculated to determine if there was a correlation between the safety performance of the participants and the accuracy of scoring at the .05 alpha level. As with the correlations between the participants accuracy of scoring at the beginning of one session and the safety behavior of the participants later on during the same session, the correlations between the safety performance on one session and the accuracy of scoring the DVD on the following session were based on the number of sessions that consisted of watching and collecting data on the confederate in the DVD as well as typing. Therefore, the degrees of freedom are smaller for some target responses than for other target responses since participants collected data on some target responses before collecting responses on other target responses. The degrees of freedom for each participant and each target response are listed in table 18.

Five correlations were calculated for participants 1a and 2a, one was calculated for participant 3a, and five correlations were calculated for participant 4a. The difference in number of correlations calculated for each participant is due to the fact that correlations were not always able to be calculated due to ceiling effects where all accuracy of scoring or safety behavior scores were 100%. The mean correlations for each participant are as follows: participant 1a (-.10), participant 2a (-.13), participant 3a (-.21), and participant 4a (.01). There were 24 opportunities to calculate a correlation but only 16 correlations were able to be calculated due to ceiling effects. Of the 16 correlations that were calculated, seven were positive and nine were negative.

Table 18. Degrees of freedom for correlations calculated between safety behavior during one session and accuracy of scoring at the beginning of the following session for each participant. Numbers in the table indicate the degrees of freedom. N/A indicates no correlation was able to be calculated due to a ceiling effect where all scores for safety behavior or accuracy of scoring were 100%.

	Head and Neck Position	Shoulder Position	Leg Position	Forearm Position	Trunk Position	Feet Position
Participant 1a	26	26	26	6	6	N/A
Participant 2a	3	N/A	3	17	17	17
Participant 3a	N/A	N/A	17	N/A	N/A	N/A
Participant 4a	5	N/A	5	21	21	21

Figure 13 displays the words typed per minute for each individual participant across all three phases.

Figure 13. Words typed per minute for Participants 1a, 2a, 3a, and 4a. Open circles indicate sessions when direct observations were conducted. Open triangles indicate sessions when indirect observations were conducted.

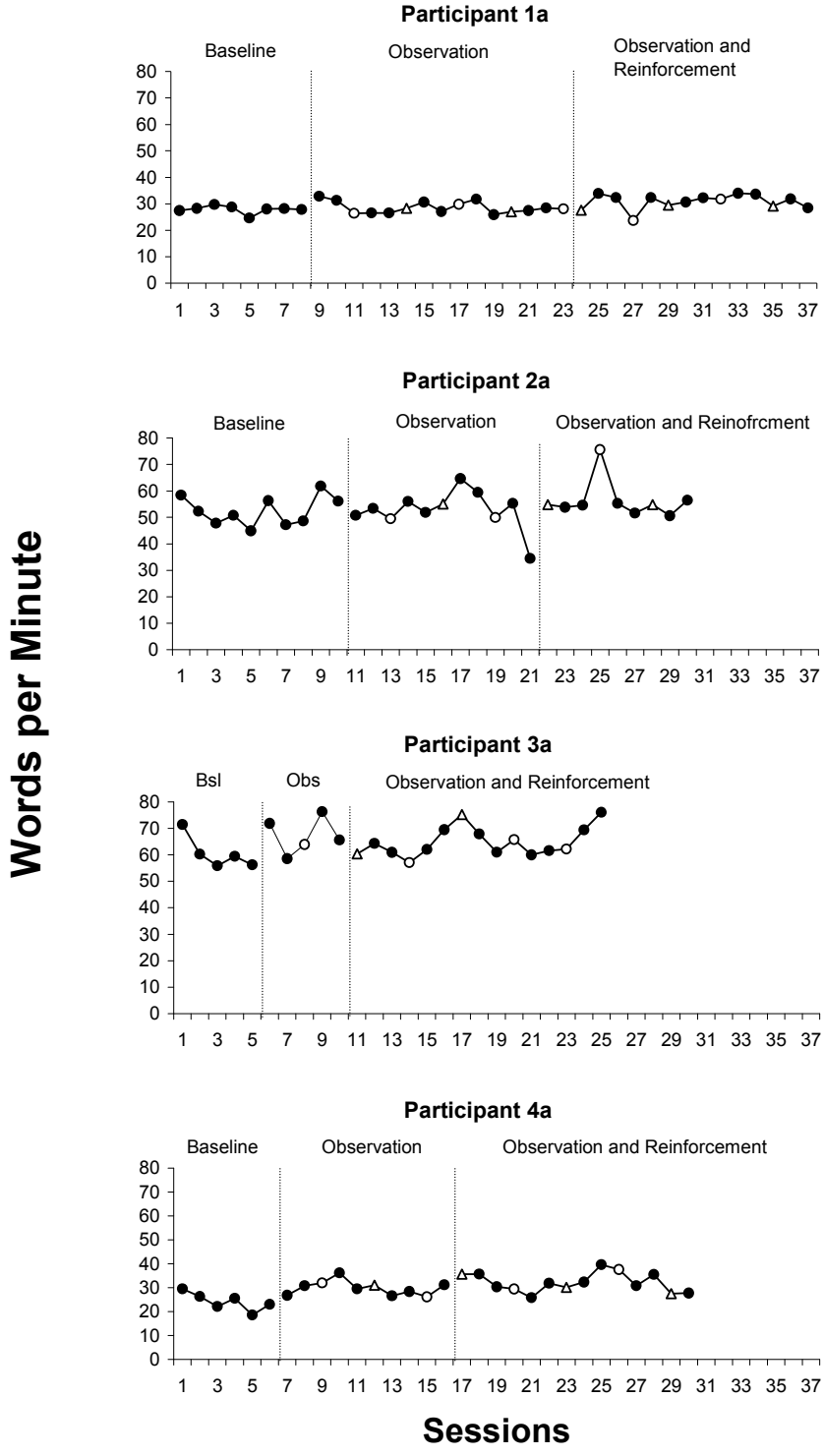


Figure 14 illustrates the data for participant 1a during one of the experimenter observation probe sessions (session 23) for each target response. A two-minute probe was conducted on every third session. Direct and indirect observations did not have any obvious effect on safety performance for participants 1a, 2a, and 3a. All other graphs that display no changes in behavior in the time before the probes to during the probe or from during the probe to after the probes for all other participants look similar to Figure 14. Therefore Figure 14 will be included as a model for the other graphs that do not show an effect rather than including every graph that did not show an effect. For participant 1a, there was a change in safety performance from the two minutes immediately before the probe to the two minutes during the probe during sessions 11 (forearm and trunk positions), 17 (shoulder position), 29 (forearm position), and 35 (forearm position). Direct probes were conducted on sessions 11 and 17 whereas indirect probes were conducted on sessions 29 and 35. Figure 15 depicts session 11. All graphs that display a change in safety performance from immediately before the probe to the two minutes during the probe look similar to Figure 15. Therefore Figure 15 will be included as a model for the other graphs that show a change in safety performance from immediately before the probe to the two minutes during the probe. There was a change in performance from the two minutes during the probe to the two minutes after the probe for sessions 11 (forearm position), 17 (shoulder position), and 29 (forearm position). Figure 16 depicts session 17. All graphs that display a change in safety performance from during the probe to immediately after the probe look similar to Figure 16. Therefore Figure 16 will be included as a model for the other graphs that show a change in safety performance from during the probe to immediately after the probe. Participant 1a was

offered reinforcement during sessions 27 and 32. She obtained reinforcement on both sessions.

Figure 14. Probe data for session 23 for Participant 1a. The open circles indicate when the two-minute direct experimenter probes occurred.

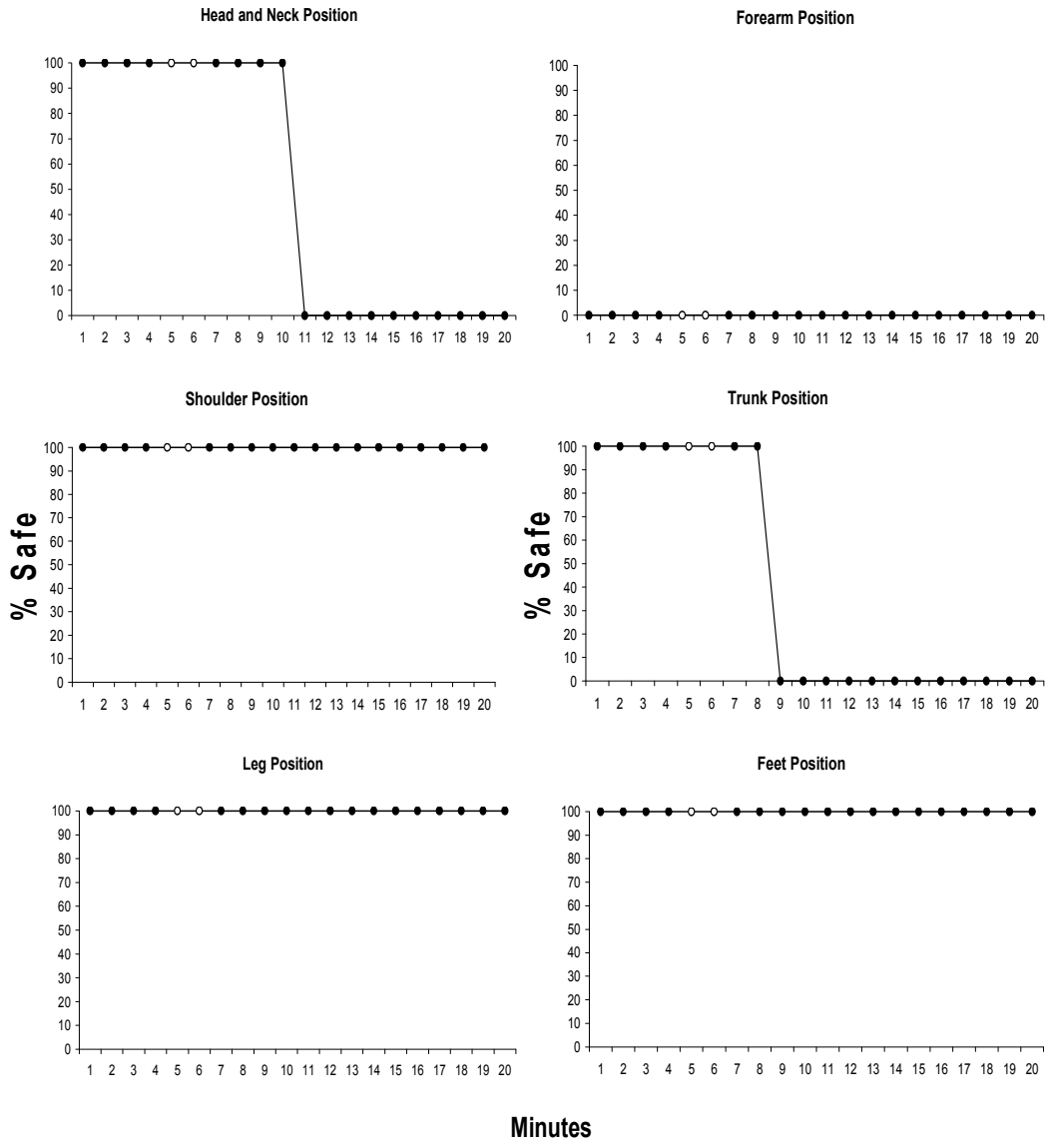


Figure 15. Probe data for session 11 for Participant 1a. The open circles indicate when the two-minute direct experimenter probes occurred.

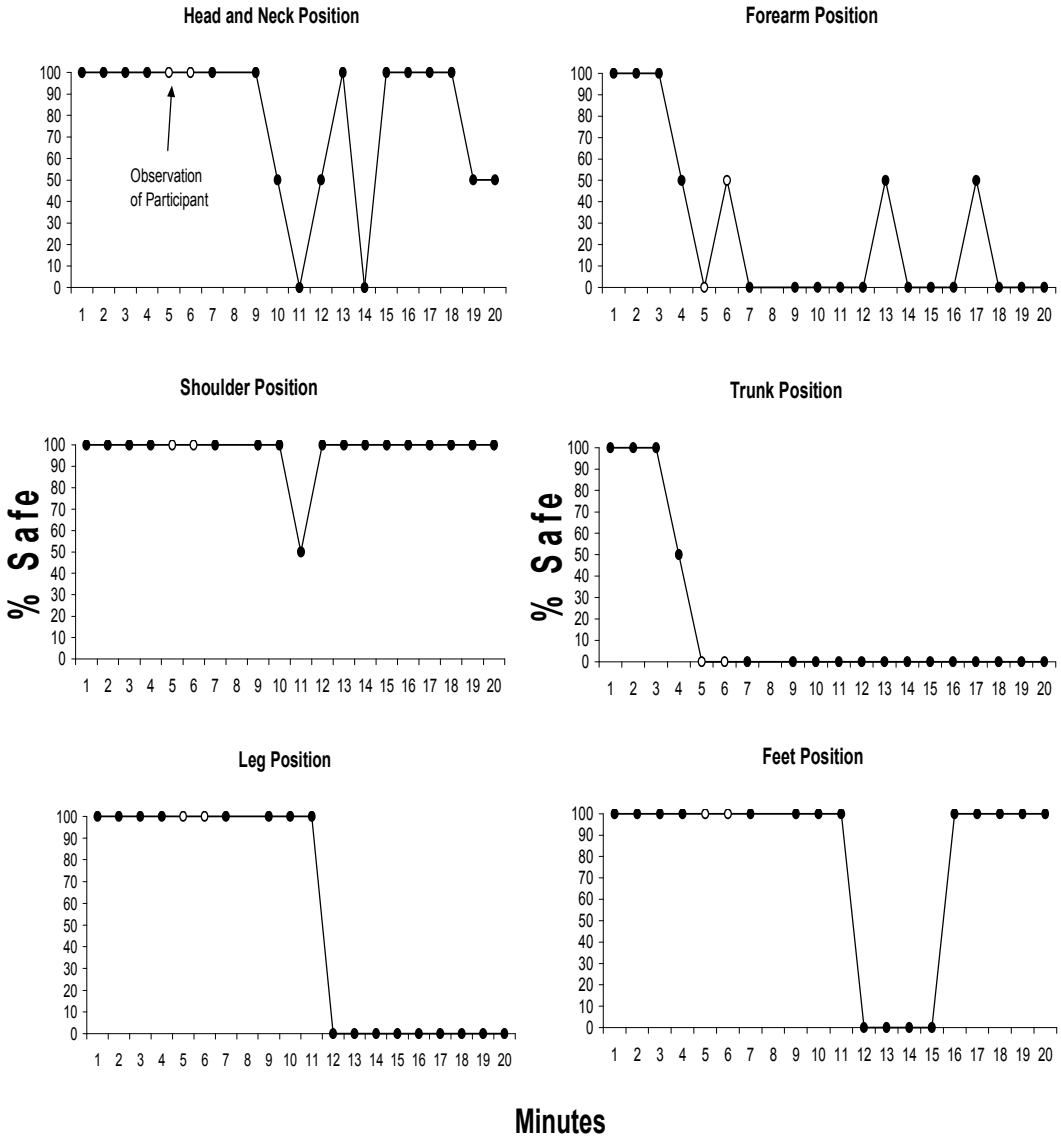
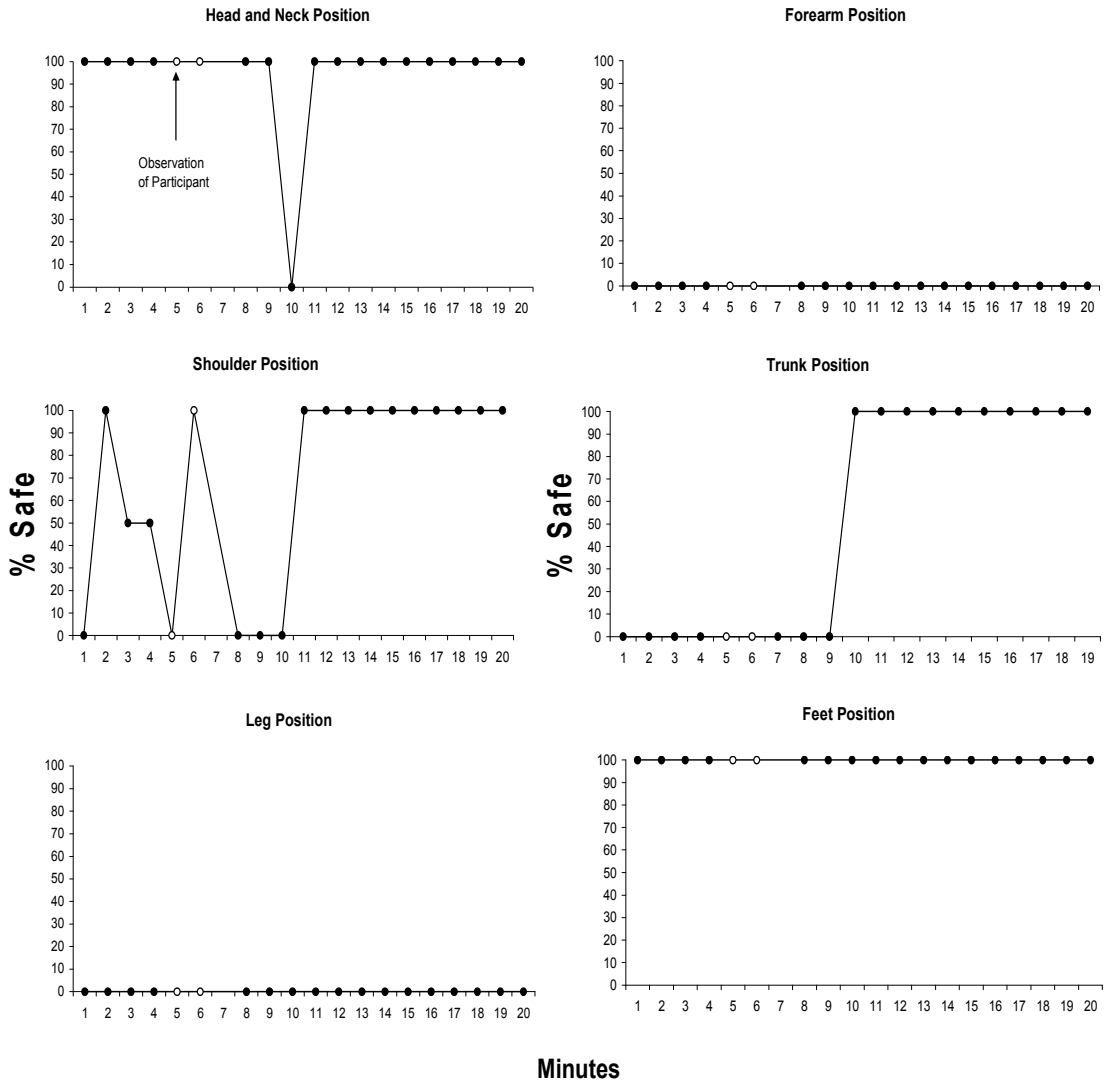


Figure 16. Probe data for session 17 for Participant 1a. The open circles indicate when the two-minute direct experimenter probes occurred.



For participant 2a there was a change in safety performance between the two minutes leading up to the probe and the two minutes during the probe for sessions 13 and 19 for forearm position. Direct probes were conducted on both sessions 13 and 19. There was also a change in safety performance between the two minutes during the probe and the two minutes after the probe for sessions 13 and 19 for forearm position. Participant 2a was only offered reinforcement during session 25. She was able to obtain the reinforcement.

For participant 3a there was no change in safety performance between the two minutes leading up to the probe and the two minutes during the probe, nor was there a change in safety performance between the two minutes during the probe and the two minutes after the probe for any target responses. Participant 3a was offered reinforcement during sessions 14 and 20 but only obtained reinforcement on session 20. During session 14 her leg position was not safe so at the end of the session, the experimenter gave participant 3a feedback about her leg position.

For participant 4 there was a change in safety performance between the two minutes leading up to the probe and the two minutes during the probe for sessions 9 (feet and leg positions), 12 (forearm position), 15 (leg position), 17 (feet and leg positions), 20 (feet and leg positions), 23 (trunk, feet, and leg positions), 26 (trunk, feet, and leg positions), and 29 (forearm, feet, and leg positions). Direct probes were conducted on sessions 9, 15, 20, and 26. Indirect probes were conducted on sessions 12, 17, 23, and 29. There was a change in safety performance between the two minutes during the probe and the two minutes after the probe for sessions 15 (feet and leg positions), 26, (trunk and leg positions), and 29 (feet and leg positions). Reinforcement was offered to participant

4a during sessions 20 and 26 but only obtained on session 26. During session 20, the trunk position of participant 4a was not safe so she was given feedback about her trunk position by the experimenter at the end of the session.

Tables 19 – 22 depict the average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average percent increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for all four participants.

Table 19. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 1a. White spaces indicate baseline sessions, light gray spaces indicate observation sessions and dark gray spaces indicate observation with reinforcement and feedback sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease. It is also indicated whether the probe was "direct" or "indirect."

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
11	before - during	0%	0%	0%	0%	− 75%	− 50%
Direct	during - after	0%	0%	0%	0%	0%	− 25%
14	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
17	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	− 50%	0%	0%	0%	0%
20	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
23	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
24	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
27	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
29	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	− 25%
32	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	− 50%	0%
35	before - during	0%	0%	0%	0%	0%	+ 75%
Indirect	during - after	0%	0%	0%	0%	0%	0%

Table 20. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 2a. White spaces indicate baseline sessions, light gray spaces indicate observation sessions and dark gray spaces indicate observation with reinforcement and feedback sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease. It is also indicated whether the probe was "direct" or "indirect."

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
13	before - during	0%	0%	0%	0%	0%	− 25%
Direct	during - after	0%	0%	0%	0%	0%	+ 25%
16	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
19	before - during	0%	0%	0%	0%	0%	+ 25%
Direct	during - after	0%	0%	0%	0%	0%	− 50%
22	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
25	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
28	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%

Table 21. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 3a. White spaces indicate baseline sessions, light gray spaces indicate observation sessions and dark gray spaces indicate observation with reinforcement and feedback sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease. It is also indicated whether the probe was "direct" or "indirect."

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
8	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
11	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
14	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
17	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
20	before - during	0%	0%	0%	0%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
23	before - during	0%	0%	0%	0%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%

Table 22. The average % increase or decrease between the two minutes immediately before the experimenter probe and the two minutes during the experimenter probe as well as the average % increase or decrease between the two minutes during the experimenter probe and the two minutes immediately following the experimenter probe for participant 4a. White spaces indicate baseline sessions, light gray spaces indicate observation sessions and dark gray spaces indicate observation with reinforcement and feedback sessions. The plus (+) and minus (-) symbols indicate whether the average % change was an increase or a decrease. It is also indicated whether the probe was "direct" or "indirect."

Session Number		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
9	before - during	0%	0%	+ 100%	+ 50%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
12	before - during	0%	0%	0%	0%	0%	− 75%
Indirect	during - after	0%	0%	0%	0%	0%	0%
15	before - during	0%	0%	+ 25%	0%	0%	0%
Direct	during - after	0%	0%	− 50%	− 25%	0%	0%
17	before - during	0%	0%	+ 100%	+ 100%	0%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
20	before - during	0%	0%	+ 100%	+ 75%	0%	0%
Direct	during - after	0%	0%	0%	0%	0%	0%
23	before - during	0%	0%	+ 100%	+ 50%	− 75%	0%
Indirect	during - after	0%	0%	0%	0%	0%	0%
26	before - during	0%	0%	+ 100%	+ 100%	+ 100%	0%
Direct	during - after	0%	0%	− 50%	0%	− 100%	0%
29	before - during	0%	0%	+ 100%	+ 100%	0%	− 25%
Indirect	during - after	0%	0%	− 50%	− 50%	0%	0%

Table 23 illustrates the percentage of probe sessions for all four participants when a change in safety performance occurred and how much of a change occurred.

Table 23. Percentage of probe sessions during each phase when a change in safety performance occurred.

Participant		Head and Neck	Shoulder	Leg	Feet	Trunk	Forearm
1a	before - during increase (baseline)	N/A	N/A	N/A	0%	14%	0%
	before - during decrease (baseline)	N/A	N/A	N/A	0%	0%	14%
	before - during increase (observation)	0%	0%	0%	N/A	N/A	N/A
	before - during decrease (observation)	0%	0%	0%	N/A	N/A	N/A
	before - during increase (observation with reinforcement)	0%	0%	0%	0%	0%	33%
	before - during decrease (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after increase (baseline)	N/A	N/A	N/A	0%	0%	0%
	during - after decrease (baseline)	N/A	N/A	N/A	0%	0%	14%
	during - after increase (observation)	0%	0%	0%	N/A	N/A	N/A
	during - after decrease (observation)	0%	20%	0%	N/A	N/A	N/A
	during - after increase (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after decrease (observation with reinforcement)	0%	0%	0%	0%	33%	33%
2a	before - during increase (baseline)	0%	0%	0%	N/A	N/A	N/A
	before - during decrease (baseline)	0%	0%	0%	N/A	N/A	N/A
	before - during increase (observation)	N/A	N/A	N/A	0%	0%	33%
	before - during decrease (observation)	N/A	N/A	N/A	0%	0%	33%
	before - during increase (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	before - during decrease (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after increase (baseline)	0%	0%	0%	N/A	N/A	N/A
	during - after decrease (baseline)	0%	0%	0%	N/A	N/A	N/A
	during - after increase (observation)	N/A	N/A	N/A	0%	0%	33%
	during - after decrease (observation)	N/A	N/A	N/A	0%	0%	33%
	during - after increase (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after decrease (observation with reinforcement)	0%	0%	0%	0%	0%	0%
3a	before - during increase (baseline)	N/A	N/A	N/A	0%	0%	0%
	before - during decrease (baseline)	N/A	N/A	N/A	0%	0%	0%
	before - during increase (observation)	0%	0%	0%	N/A	N/A	N/A
	before - during decrease (observation)	0%	0%	0%	N/A	N/A	N/A
	before - during increase (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	before - during decrease (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after increase (baseline)	N/A	N/A	N/A	0%	0%	0%
	during - after decrease (baseline)	N/A	N/A	N/A	0%	0%	0%
	during - after increase (observation)	0%	0%	0%	N/A	N/A	N/A
	during - after decrease (observation)	0%	0%	0%	N/A	N/A	N/A
	during - after increase (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after decrease (observation with reinforcement)	0%	0%	0%	0%	0%	0%
4a	before - during increase (baseline)	0%	0%	80%	N/A	N/A	N/A
	before - during decrease (baseline)	0%	0%	0%	N/A	N/A	N/A
	before - during increase (observation)	N/A	N/A	N/A	33%	0%	0%
	before - during decrease (observation)	N/A	N/A	N/A	0%	0%	33%
	before - during increase (observation with reinforcement)	0%	0%	100%	100%	20%	0%
	before - during decrease (observation with reinforcement)	0%	0%	0%	0%	20%	20%
	during - after increase (baseline)	0%	0%	0%	N/A	N/A	N/A
	during - after decrease (baseline)	0%	0%	20%	N/A	N/A	N/A
	during - after increase (observation)	N/A	N/A	N/A	0%	0%	0%
	during - after decrease (observation)	N/A	N/A	N/A	33%	0%	0%
	during - after increase (observation with reinforcement)	0%	0%	0%	0%	0%	0%
	during - after decrease (observation with reinforcement)	0%	0%	67%	20%	20%	0%

Interobserver Agreement

Table 24 illustrates the IOA data for Experiment 2. IOA was collected on 46% of sessions (56 out of 122 sessions). IOA never fell below 90% at any point during Experiment 2, therefore the research assistants who were scoring videos never needed to be re-trained at any point during the study.

Table 24. IOA data for Experiment 2.

	All Target Responses	Head and Neck Position	Trunk Position	Shoulder Position	Forearm Position	Leg Position	Feet Position
Average	97%	100%	92%	99%	93%	100%	100%
Standard Deviation	3.8	0.5	2.9	1.9	4.1	0.7	0
Range	92% - 100%	97% - 100%	90% - 100%	90% - 100%	90% - 100%	95% - 100%	100% - 100%

Discussion

The primary goal of Experiment 2 was to examine if safety behavior was affected by feedback and the offer of reinforcement. Experiment 2 also examined if safety behavior was affected by direct and indirect observation by the experimenter. As with Experiment 1, Experiment 2 was an attempt to assess whether or not a correlation existed between the accuracy of participant scoring and the safety of participant behavior. Furthermore, as in Experiment 1, the number of words typed per session/minute by the participants was recorded to ensure that engaging in safe typing behavior did not impede the productivity of the participants. The data in Experiment 2 suggest that engaging in safe typing behavior does not impede an individual's ability to maintain their usual speed or accuracy of typing.

Effects of Conducting Observations

The results of Experiment 2 suggest that an increase in the safe typing behavior of three of the four participants (participants 1a, 2a, and 3a) occurred as a result of conducting observations along with the offer of reinforcement and feedback when the observer was unaware that their performance was being observed. There was an increase in safety performance for most behaviors for participants 1a, 2a, and 3a. There was a ceiling effect for shoulder position for participants 2a and 4a. Therefore it is not possible to determine whether or not the intervention had any effect on shoulder position for those two participants. The safe performance of forearm and trunk positions for participant 3a coincided with the introduction of the observation phase for head and neck, shoulder, and leg positions. Therefore it is not possible to determine what type of effect the introduction of the reinforcement and feedback phase had on forearm and trunk positions.

There was also an increase in safety performance for the following target responses for participant 4a: trunk, feet, and head and neck positions. Furthermore, there was a decrease in safety performance for forearm and leg positions.

One participant (participant 4a) did not display an overall increase in safe typing behavior. Rather, the safety performance of participant 4a only increased when the participant was being directly or indirectly observed by the experimenter.

Effects of Reinforcement

Reinforcement had a consistent positive effect on the safety performance of all four participants when paired with conducting observations and collecting data on those observations when the observers were unaware they were being observed. Participants 1a, 2a, and 3a showed a consistent overall increase in safe typing behavior. Even if participant behavior did not improve overall, as was the case with participant 4a, while participants were being observed by the experimenter during the observation and reinforcement phase, there was a consistent trend of safe typing behavior. For participants 1a and 2a reinforcement was all that was necessary to bring about a consistent increase in safe typing behavior for all target responses. For participants 3a and 4a, feedback had to be given by the experimenter one time to clarify what was expected of the participants. During the first direct experimenter probe of the reinforcement phase, participants 3a and 4a did not engage in one of the target responses correctly (leg position for participant 3a and trunk position for participant 4a).

Effects of Feedback

Participants received feedback on their performance when they were not engaging in safe typing behavior during the experimenter probe sessions for direct observation.

Feedback was not necessary for participants 1a and 2a because all target responses were engaged in correctly during direct observation probes. Participants 3a and 4a did require feedback for leg and trunk positions, respectively, immediately following their first direct observation of the reinforcement phase. Feedback proved to be quite effective when used in conjunction with reinforcement, as feedback only had to be given once to both participants in order to see a positive change in typing behavior.

Effects of Experimenter Probes

The effects of direct and indirect experimenter probes did not have any consistent effects on the safety performance of three of the four participants (1a, 2a, and 3a). The direct experimenter probes did however, have a positive effect on the safety performance of participant 4a. During direct observations there was an increase in safety performance for leg, feet, and trunk positions. Conversely, during indirect observations, there was an increase in safety performance of leg and feet positions but forearm and trunk safety decreased during a couple of sessions.

Effects of Reactivity to Confederate

The presence of a confederate did not appear to have any effect on the safety performance of participant 1a as compared to the results obtained in Experiment 1. Only when the offer of reinforcement was introduced did the safety performance increase to near perfect or perfect levels (100%). For participant 2a, safety performance increased for feet and trunk position during the observation phase but there was still more variability than during the observation with reinforcement and feedback phase. During the observation with reinforcement and feedback phase, safety performance was much more stable, especially for forearm position. The presence of a confederate did not

appear to have any effect on the safety performance of leg position for participant 3a. It was only during the observation with reinforcement and feedback phase that the safety performance for leg position increased to 100%. For participant 4a, there was also no consistent effect from the presence of a confederate

Owing to the inconsistencies with the above-mentioned results, it is not possible to suggest that the presence of a confederate had any definitive effect on the safety performance of the participants. Conversely, the above-mentioned results do suggest that the offer of reinforcement along with feedback (when behavior is not safe) result in an increase in safety performance when used in conjunction with observing and collecting data on someone engaged in a particular task.

Correlation Between Accuracy and Safety

As in Experiment 1, no correlation was found between the accuracy of scoring by the participants and the safe typing behavior of the participants. In contrast to the findings of Experiment 1, most of the participants in Experiment 2 were able to discriminate between safe and unsafe behavior with their own typing behavior more easily than with the typing behavior of the confederate in the video. Evidence of their ability to discriminate between their own safe and unsafe behavior better than the safe and unsafe behavior of the confederate can be seen in the fact that, for the most part, the safe behavior scores of the participants were higher than their accuracy of scoring. Participant 4a was the only participant who found it easier to discriminate between safe and unsafe typing behavior of the confederate in the video rather than her own behavior.

Words Typed Per Minute

As hypothesized, increases in safe typing behavior did not impede the ability of the participants to type. The implications of increases in safety behavior not inhibiting productivity are sure to be welcomed by businesses. Many companies may be reluctant to implement a safety protocol with their employees for fear it will lead to a decrease in productivity. The results of the current study do not support the notion that an increase in safe behavior will lead to a decrease in efficiency.

Strengths and Weaknesses of the Study

As with Experiment 1, one strength of Experiment 2 is that it eliminated the possible extraneous variable of reactivity to constant experimenter observation combined with the observer effect seen in the Alvero and Austin (2004) and Sasson and Austin (2005) studies. The two-minute experimenter probes were conducted to determine if reactivity had any effect on the safety performance of the participants. There was some reactivity displayed by participant 4a during direct as well as indirect observations. Based on participant 4a's exit interview, the reactivity displayed by her was due in large part to the offer of reinforcement. In the exit interview participant 4a stated that her behavior improved when being observed by the experimenter because she was highly motivated to leave 10 minutes early and still get paid for the entire session.

Another strength of the study was the delivery of consequences for safe and unsafe behavior. During the observation with reinforcement and feedback phase of the study, if participants did not engage in the target responses correctly they were given verbal feedback. If participants did engage in the target responses correctly they were given reinforcement in the form of being allowed to leave early and still be paid for the

entire session. The delivery of consequences is an improvement over the methods used in Experiment 1 where there were no differences in the consequences for safe versus unsafe behavior.

A final strength of the study is the fact that it was conducted in a laboratory setting thereby eliminating as many extraneous variables as possible. Nevertheless, conducting a study in a laboratory setting can also be seen as a weakness of the study due to the fact that the findings may not generalize to a real-world setting.

An additional weakness of the study is the fact that there was a baseline shift for two target responses not exposed to the observation phase for participant 3a. The baseline shift for forearm and trunk positions coincided with the introduction of the observation phase for head and neck, shoulder, and leg positions.

Another weakness of the study was that there was no comparison of a confederate condition to an alone condition (where the participant types in a room alone). It would have been interesting to compare the results of the two different conditions to see if the presence of a confederate had any effect on the behavior of the participants. The current study allows one to make assumptions about what effects the presence of a confederate had on the behavior of the participants but does not allow one to make any clear conclusions due to the lack of a comparison "alone" condition. Future research should address this problem by conducting a replication of Experiment 2 with two different conditions: one where the participants work with a confederate and one where the participants work alone.

A final weakness of the study is the amount of variability seen in the safety performance of the participants. Although three of the four participants in Experiment 2

showed improvements in their safety performance, there was quite a bit of variability in their performance. Ideally, the behavior of the participants should have been more stable. In the future, researchers should try to determine the factors that are responsible for the high variability in safety performance.

General Discussion

The results of the current study suggest that the observer effect is not as effective for participants who are unaware their performance is being recorded by the experimenter as it is for participants who know their performance is being recorded by the experimenter.

One can speculate that the reason for the contrasting results between the current study and the Alvero and Austin (2004) study is that the participants in the current study did not have any sort of aversive consequence associated with sitting in an unsafe position. The participants in the Alvero and Austin (2004) study were aware that their performance was being recorded with a video camera. Therefore they knew the experimenters were observing their performance. Based on the information the participants were given on posture along with the fact that their performance was being recorded, one can assume that those participants were aware that the experimenters were interested in the posture of the participants. Hence the need for a video camera along with the data/observations on ergonomic behavior the participants were required to collect of the confederate video. It is very possible that the participants in the Alvero and Austin (2004) study were displaying demand characteristics (Kazdin, 1992) by engaging in the behavior they thought the experimenters wanted to see.

Based on the exit interviews conducted on the participants in the current study, it can be seen that many of the participants were also anxious to please the experimenter but were going about doing so the wrong way. Many of the subjects in the current study thought the experimenter was interested in having the participants increase their speed and accuracy of typing. Therefore, most of the participants were very focused on their

typing but not very focused on their posture. Experiment 2 was an attempt to address this issue by letting the participants know that they would be given reinforcement (in the form of leaving early but still getting paid for the entire session) for exhibiting safe posture while typing. Participants in Experiment 2 were also given feedback on their posture if their posture was unsafe. Despite the fact that reinforcement was not given to the participants during every session of phase 3, three of the four participants drastically improved their posture even during sessions when they knew they would not receive reinforcement. One can speculate that their posture improved on sessions when they were not eligible to receive reinforcement because they were trying to please the experimenter. Given the differences between the results of the current study and the results obtained by Alvero and Austin (2004), future researchers should try to determine the variables that account for the differences between the two studies.

The distribution of reinforcement in the current study was effective at changing the behavior of the participants but proved to be a weakness of the study as well. For example, the reinforcement may have masked the effects of conducting observations. It is possible that if participants had completed more sessions (maybe 60 – 70 sessions) there would have been an effect without the use of reinforcement. After all, there was an improvement in posture for shoulder position for participant 1a, for trunk and feet position for participant 2a, and for head and neck and shoulder position for participant 3a during the observation phase (phase 2). Maybe it was just a matter of time before their posture improved for the remaining target behaviors as well.

Another weakness of the study is that that feedback might have been enough to change unsafe behavior to safe behavior without the use of reinforcement as well. Future

researchers should try to replicate the current study with the exception of offering reinforcement. The experimenters should simply give feedback to participants on their safety performance.

Additionally, the current study might have been more effective if all six target behaviors were separated rather than breaking them into two groups of three behaviors each. That would allow one to examine the effectiveness of the observer effect on each behavior in isolation. The participants would be required to collect data on one target behavior, then on two target behaviors, then on three target behaviors, and so on until they were collecting data on all six target behaviors. It is possible that by making the participants in the current study learn how to collect data on three behaviors at once they did not learn how to engage in those behaviors properly because they did not fully understand each behavior. Future research should address these issues.

In the future, researchers should also examine what, if any, differences exist when the observer effect is used to train discrete behaviors (i.e. lifting heavy objects, wearing safety garments properly) rather than continuous behaviors such as posture during typing. It is possible that teaching people to engage in discrete behaviors safely is easier than teaching people to engage in continuous behaviors safely. This may be especially true when it is more comfortable to type in an unsafe position rather than in a safe position such as stated by some of the participants during exit interviews. Conversely, engaging in a behavior such as lifting heavy objects may be more comfortable when it is done safely than when it is done in an unsafe manner.

Another variable future research should examine is the degree to which exposure or history with musculoskeletal disorders (MSDs) affects safety interventions.

Specifically, it may be of interest to assess if the observer effect yields stronger results when persons who are older or who have a history of MSDs, such as carpal tunnel syndrome, serve as participants. Sasson and Austin (2005) reported that the participants in their study who had histories of MSDs showed higher overall performance gains than participants who did not have histories of MSDs, thus, suggesting a possible area of future research.

It is clear from the Alvero and Austin (2004) study that the observer effect does exist when people are aware that their performance is being observed for extended periods of time. Researchers should try to find a way to make it as effective for the lone-worker as it is for people who work with others.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Head and neck to be upright, or in-line with the torso - not bent down or back. Center-back of head from back tip of buttocks	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Trunk should be perpendicular to the floor.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Shoulders and upper arms to be in-line with the trunk/torso,generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outermost part of the back. Top-back of shoulder must be between 175° and 195° to back tip of buttocks.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173°and 183° to pinky knuckle.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Thighs to be parallel to the floorand lower legs to be perpendicular to floor (between 80 and 100 degrees). Thighs may be slightly elevated above knees	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Both feet rest flat on the floor.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Partipicant #_____ **Name of Scorer:**_____

Session # _____ **Date:** _____

		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	Head and neck to be upright, or in-line with the torso - not bent down or back. Center-back of head from back tip of buttocks	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Trunk should be perpendicular to the floor.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Shoulders and upper arms to be in-line with the trunk/torso,generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outermost part of the back. Top-back of shoulder must be between 175° and 195° to back tip of buttocks.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173°and 183° to pinky knuckle.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Thighs to be parallel to the floor and lower legs to be perpendicular to floor (between 80 and 100 degrees). Thighs may be slightly elevated above knees	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	Both feet rest flat on the floor.	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Partipicant #_____ **Name of Scorer**_____

Session # _____ **Date:** _____

Appendix B

Exit Interview (Experiment 1)

Below is a list of the questions asked of each participant at the end of the last session and a summary of their answers.

Q1 (Question #1): What did you think was being measured before you received the information on ergonomics? P1 (Participant #1): Did not know. P2, P3, and P4: Speed of typing. Q2a: Did you understand what was expected of you after receiving the information on ergonomics? P1, P2, P3, and P4: Yes. Q2b: What did you think was expected of you? P1 and P4: To sit in a correct position. P2: Thought the experimenter was measuring how she sat in the chair affected the amount of words she could type. P3: Proper posture and typing safely. Q3: Did you find the information on ergonomics difficult to understand? P1 and P2: No. P3: Yes. The definitions were very technical. While collecting data on the behavior of the confederate in video she had to keep reading and re-reading the definitions. P4: The information during the information phase was understandable but during the observation phase when collecting data on all six responses it was overwhelming. Q4: Did you find yourself thinking about body posture when you were being observed? P1, P2, and P3: Yes. P4: A little. More so when watching the video than when being observed. Q5: Did you find yourself thinking about body posture when you were not being observed? P1 and P3: Yes. P2: No. She thought about how she was typing. P4: No. Q6: While I was observing you, you did not always engage in the ergonomically safe posture I asked you to engage in. What was the reason for this? P1: Force of habit. P2: Does not know why. P3: More comfortable to shift body positions that to sit in

the same position for the entire session. P4: When experimenter came in the room the participant was already in an unsafe position and she remembered that when scoring the videos, if the person in the video was unsafe for even a split second out of the entire 25 second interval, the entire interval should be considered "unsafe" (using whole interval scoring). Therefore, the experimenter would already consider her "unsafe" so what was the point of switching to a safe position (for observation phase)? For information phase, by the time the experimenter came in to observe her she had already forgotten about the definitions. Q7: What did you think the purpose of conducting observations of the videos was? P1: To improve her posture. P2: To see the difference in how most people sit when they're typing and that most people have bad posture. P3: To show participants the correct and incorrect way of sitting. P4: To train her how to sit properly. Q8a: Do you think your behavior changed throughout the course of the study? P1, P2, P3, and P4: Yes. Q8b: If so, how? P1: She improved her speed of typing. P2, P3: More aware of her posture. Typing and posture improved. P4: Posture improved. Q9: Your performance was very unstable for most of the study. In other words, sometimes your body posture was safe while at other times it was unsafe. Why do you think this occurred? P1: She was stressed – did not like being observed. P2: Does not know why this occurred. P3: Felt that watching the video tapes helped stabilize her posture. P4: It is harder to sit properly than to slouch. Q10: Was there anything that you said to yourself while you were being observed? P1, P2, P3, and P4: No. Q11: Was there something that you said to yourself each time you conducted an observation of the videos? P1: She was thinking about what she was supposed to observe. P2: Told herself to pay attention to all the details of the video. P3 and P4: No.

Q12a: Do you think conducting observations of the videos changed your performance? P1: No. P2 and P3: Yes. P4: No. It would have helped to show examples when she first started conducting observations of what safe and unsafe posture look like. That way, she would know exactly what she was looking for while conducting observations. Q12b: If so, how? P2: When she was aware of how she was sitting she would shift to make herself sit the right way. P3: She was able to see a picture of what she was and was not supposed to be doing while she was typing. Q13: Were you comfortable having the experimenter observe your behavior? P1, P3, and P4: No. P2: Yes. Q14: Did you put any pressure on yourself to perform well? P1: Yes – to type well but not for posture. P2: No. P3: Yes. P4: Only in the beginning of each session. After typing for a few minutes she did not think about her posture anymore. Q15: Do you feel that the experimenter put any pressure on you to perform well? P1, P2, P3, and P4: No. Q16: Do you feel that you would have performed more safely if the experimenter had given you feedback on your performance? P1 and P3: Yes. P2: Only for her typing speed – not for posture. P4: Maybe. Q17: What would have helped you be more safe, or motivated you to be more safe? P1: A better keyboard. P2: Nothing. P3: Telling her that negative consequences (neck injury, carpal tunnel syndrome, etc.) would occur if she did not perform safely. P4: Telling her when she is sitting in an unsafe position. Q18: Do you feel that you would have performed more safely if there were consequences in place for doing so (i.e., receiving tokens for prizes, raffle tickets, or monetary consequences)? P1, P2, and P4: Yes. P3: Not much because she was already being paid to participate in the study anyway.

Appendix C

In contrast with psychologists, psychiatrists can also continue functioning as physicians – giving physical examinations, diagnosing medical problems, and the like. In actuality, however, the only aspect of medical practice that most psychiatrists engage in is prescribing psychoactive drugs, chemical compounds that can change how people feel and think.

There has recently been a lively and sometimes acrimonious debate concerning the merits of allowing clinical psychologists, with suitable training, to prescribe psychoactive drugs. Predictably, such a move is opposed by psychiatrists, for it would represent a clear invasion of their professional turf. Profits are an issue, but so is the question of whether a non-M.D. can learn enough about biochemistry and physiology to monitor the effects of drugs and protect patients from adverse side effects and drug interactions. This debate will undoubtedly continue for some time before any resolution is reached.

A psychoanalyst has received specialized training at a psychoanalytic institute; the program usually involves several years of clinical training as well as an in-depth psychoanalysis of the trainee. Although Sigmund Freud held that psychoanalysts do not need medical training, until recently most psychoanalytic institutes required of their graduates an M.D. and a psychiatric residency. Thus, it can take up to ten years of graduate work to become a psychoanalyst.

A psychiatric social worker obtains an M.S.W. (Master of Social Work) degree. There are also master's and doctoral programs for counseling psychologists, somewhat similar to graduate training in clinical psychology but usually with less emphasis on research.

The term clinician is often applied to people who, regardless of professional degree, offer diagnostic and therapeutic services to the public. Thus, clinicians can include Ph.D.'s in clinical or counseling psychology, Psy.D.'s, holders of an M.S.W. degree, and psychiatrists. Or the term can be used for people who do both research and clinical work, such as the authors of this textbook, when they are performing clinical services. A highly diverse group of people can be called psychopathologists. These people conduct research into the nature and development of the various disorders that their therapist colleagues try to treat. Psychopathologists may come from any number of disciplines; some are clinical psychologists, but the educational backgrounds of others may range from biochemistry to developmental psychology. What unites them is their commitment to the study of how abnormal behavior develops. Since we still have much to learn about psychopathology, the diversity of backgrounds and interests is an advantage, for it is too soon to be certain in which area major advances will be made.

As psychopathologists, our interest is in the causes of deviant behavior. The search for these causes has gone on for a considerable period of time. Before the age of scientific inquiry, all good and bad manifestations of power beyond the control of humankind – eclipses, earthquakes, storms, fire, serious and disabling disease, the passing of the seasons – were regarded as supernatural. Any behavior seemingly beyond individual control was subject to similar interpretation. The earliest writings of the philosophers, theologians, and physicians who studied the troubled mind found its deviancy to reflect the displeasure of the gods or possessions by demons.

The doctrine that an evil being, such as the devil, may dwell within a person and control his or her mind and body is called demonology. The ancient Babylonians had in their religion a specific demon for each disease. Idta was the demon who caused insanity. Examples of demonological thinking can be found in the records of the early Chinese, Egyptians, and Greeks as well. Among the Hebrews, deviancy was attributed to possession of the person by bad spirits, after God in his wrath had withdrawn protection. Christ is reported to have cured a man with an unclean spirit by casting out the devils from within him and hurling them onto a herd of swine (Mark 5:8 – 13).

Exorcism, the casting out of evil spirits by ritualistic chanting or torture, typically took the form of elaborate prayer rites, noisemaking, forcing the afflicted to drink terrible-tasting brews, and on occasion more extreme measures, such as flogging and starvation, to render the body uninhabitable to the devils.

In the fifth century B.C. Hippocrates (460? – 377? B.C.), often regarded as the father of modern medicine, separated medicine from religion, magic, and superstition.

Appendix D

Queens College/CUNY

65-30 Kissena Blvd.
Flushing, NY 11367

CONSENT TO SERVE AS A PARTICIPANT IN A RESEARCH PROJECT

Project Title: The Safety Observer Effect Across Various Work Conditions

Project Director/Investigator: Dr. Alicia Alvero, Associate Professor, Psychology Dept., (718) 997-3200

Research/Study Investigator: Adrienne Robek, M.A.

You are being asked to participate in a research project conducted through Queens College CUNY. If you decide to participate, Queens College requires that you give your signed authorization to participate in this research project.

A basic explanation of the project is written below. Please read this explanation and discuss it with the Research Investigator. If you then decide to participate in the research project, please sign the last page of this form.

Nature and Purpose of the Project:

The purpose of this study is to simulate busy work in an office setting and ask questions about it at the end.

Explanation of Procedures:

You will be given various paragraphs to type on the computer. You will either be alone or with another participant while typing. The maximum number of sessions you will be asked to participate in will be 30 but will not take part in more than 2 per day. Each session will not exceed 30 minutes in duration.

Potential Discomforts and Risks:

The potential discomforts and risks associated with this study are the same ones you would encounter on any given day while doing everyday tasks.

Potential Benefits:

The potential benefit of this study is the opportunity to practice typing.

Costs/Reimbursements:

You will be paid $10.00 per hour ($5.00 per each session).

Alternatives to Participation:

There are no alternatives to participation but you are free to terminate your participation in this study at any time. If you terminate your participation you will still be allowed to keep the money you earned for any time spent in the study.

Termination of Participation:

Participants may be terminated from the study if they fail to show up to 3 scheduled appointments.

Confidentiality:

Names of participants will never be used. Each participant will be assigned a number and will be referred to as that number (e.g. Participant #1). Any data taken on participants will be referred to as: "data for Participant 1." Names will never be used on any documents except for the consent forms. All documents associated with this study will be kept in Dr. Alicia Alvero's lab in a locked cabinet. The only people who will have access to this are people who have keys for the laboratory (Dr. Alvero, two research assistants, and myself).

Withdrawal from the Project:

Your participation in this research project is completely voluntary. You may decide to stop participating in this project at any time without penalty. You are free to leave at any time.

Who to Call if you have any Questions:

The approval stamp on this consent form indicates that this project has been reviewed and approved for the period indicated by the Queens College (CUNY) Institutional Review Board for the Protection of Human Subjects in Research and Research Related Activities.

If you have any questions about your rights as a research participant, or to report a research related injury, you may call:

Office of Regulatory Compliance, Queens College (CUNY), Telephone # (718) 997-5415.

If you have concerns or questions about the conduct of this research project you may call:

Dr. Alicia Alvero
Associate Professor, Department of Psychology
Queens College (CUNY)
Flushing, NY 11367
Telephone: (718) 997-3200

What Signing this Form Means:

By signing this consent form, you agree to participate in this research project. The purpose, procedures to be used, as well as, the potential risks and benefits of your participation have been explained to you in detail. You can refuse to participate in this study or withdraw from this research project at any time without penalty. Refusal to participate in this study or withdrawal from this study will have no effect on any services you may otherwise be entitled to from Queens College (CUNY). You will be given a copy of this consent form.

_____
Printed Name of Participant

_____ _____
Participant Signature Today's Date

_____
Printed Name of Research/Study Investigator

_____ _____
Signature of Research/Study Investigator Today's Date

Institutional Review Board Approval Stamp:

Appendix E

Script for Baseline Phase

Bring the participant into the typing room and ask them to take off their coat and put their belongings down. Tell the participant, "why don't you have a seat at the computer and I'll explain what you need to do. Here are some pages I copied out of a psychology textbook (while pointing to the pages). All you have to do is start typing page (whatever page the participant needs to type depending on the session). You just have to copy whatever is written on this page. You're going to start at the top and continue typing until I come back into the room in 20 minutes. If you finish typing page (whatever page the participant will be typing), just turn the page and start typing the next page. Keep typing until I come back in 20 minutes. Do you have any questions?

Appendix F

1. Head and neck to be upright, or in-line with the torso - not bent down or back. (Center back of head must be no less than 175° from back tip of buttocks).
2. Shoulders and upper arms to be in-line with the trunk/torso, generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outer most part of back. (Top-back of shoulders must be between 175° - 195° to back tip of buttocks).
3. Thighs to be parallel to the floor and lower legs to be perpendicular to floor (between 80 and 100 degrees). Thighs may be slightly elevated above knees.

Appendix G

1. Forearms, wrists, and hands to be straight and in-line. (Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173° and 183° to pinky knuckle.
2. Trunk should be perpendicular to the floor.
3. Both feet rest flat on the floor.

Appendix H

Script for Observation Phase on Responses 1-3

Take the participant into the "typing room" and tell them to leave their belongings there because we are going to a different room for a couple of minutes. When you and the participant get to Room E, let them in the room and say, "Why don't you have a seat?" Give them a data collection sheet (for the three target responses they were given information on in the information phase) and a pencil. Then say, "I'd like you to watch a five minute DVD of someone typing and collect data on whether or not the person is typing in a safe manner with this data sheet. I'm going to start playing the DVD and leave the room. I'll just wait outside for you to finish and when the DVD is over and you have finished collecting data, just come out and we'll go back to the other room so you can start typing."

"Before I leave I'm just going to explain how you should go about collecting data. Hit the "play" button to start the video. You will see a person sitting at a computer typing. After 25 seconds you will see a black screen on the computer counting down from 10 - 0. When you see this black screen you will record the data on the sheet I just gave you. After a few seconds you will no longer see the black screen. Instead, you will see another 25 second clip of the person typing again. After that 25 seconds has elapsed the screen will go black again and count down from 10- 0. The video will continue on this way until 10 25 second clips of the person typing have been shown. You can see here on the data sheet that there are only 10 columns – one column for each 25 second clip. The way you collect data is that you watch the person on the DVD for 25 seconds. If during the ENTIRE 25 seconds the person in the video was typing in a

safe manner – according to the definitions listed on this data sheet you would circle the "S" for "safe". If the person in the video was not typing in a safe manner you would circle the "U" for "unsafe". For example, let's say you are collecting data on "head and neck to be upright or in-line with the torso – not bent down or back. (Center-back of head must be no less than 175° from back tip of buttocks." If during the entire 25 second video clip, the person in the DVD has his head and neck upright or in-line with his torso you would mark it as an "S" on your data sheet under column 1 (point to the "S" for this definition in column 1). If the person in the DVD does not have his head and neck upright or in-line with his torso for even 1 second out of the 25 second clip then you would mark it as a "U" on your data sheet under column 1" (point to the "U" for this definition in column 1). In other words, the person in the video could have his head and neck upright or in-line with his torso for 24 seconds but if he does not have his head and neck upright or in-line with his torso for just 1 second during the entire 25 second clip, you would mark it as a "U". The same goes for the other two behaviors listed on this sheet. Do you have any questions?"

Appendix I

Script for Observation Phase on Responses 4-6

Take the participant into the "typing room" and tell them to leave their belongings there because we are going to a different room for a couple of minutes. When you and the participant get to Room E, let them in the room and say, "Why don't you have a seat?" Give them a data collection sheet (for the three target responses they were given information on in the information phase) and a pencil. Then say, "I'd like you to watch a five minute DVD of someone typing and collect data on whether or not the person is typing in a safe manner with this data sheet. I'm going to start playing the DVD and leave the room. I'll just wait outside for you to finish and when the DVD is over and you have finished collecting data, just come out and we'll go back to the other room so you can start typing."

"Before I leave I'm just going to explain how you should go about collecting data. Hit the "play" button to start the video. You will see a person sitting at a computer typing. After 25 seconds you will see a black screen on the computer counting down from 10 - 0. When you see this black screen you will record the data on the sheet I just gave you. After a few seconds you will no longer see the black screen. Instead, you will see another 25 second clip of the person typing again. After that 25 seconds has elapsed the screen will go black again and count down from 10- 0. The video will continue on this way until 10 25 second clips of the person typing have been shown. You can see here on the data sheet that there are only 10 columns – one column for each 25 second clip. The way you collect data is that you watch the person on the DVD for 25 seconds. If during the ENTIRE 25 seconds the person in the video was typing in a

safe manner – according to the definitions listed on this data sheet you would circle the "S" for "safe". If the person in the video was not typing in a safe manner you would circle the "U" for "unsafe". For example, let's say you are collecting data on "forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173° and 183° to pinky knuckle." If during the entire 25 second video clip, the person in the DVD has his forearms, wrists, and hands straight and in-line you would mark it as an "S" on your data sheet under column 1 (point to the "S" for this definition in column 1). If the person in the DVD does not have his forearms, wrists, and hands straight and in-line for even 1 second out of the 25 second clip then you would mark it as a "U" on your data sheet under column 1" (point to the "U" for this definition in column 1). In other words, the person in the video could have his forearms, wrists, and hands straight and in-line for 24 seconds but if he does not have his forearms, wrists, and hands straight and in-line for just 1 second during the entire 25 second clip, you would mark it as a "U". The same goes for the other two behaviors listed on this sheet. Do you have any questions?"

Appendix J

		1	2	3	4	5	6	7	8	9	10
1	Head and neck to be upright, or in-line with the torso - not bent down or back. Center-back of head must be no less than 175° from back tip of buttocks	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
2	Shoulders and upper arms to be in-line with the trunk/torso, generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outer most part of the back. Top-back of shoulder must be between 175° and 195° to back tip of buttocks.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
3	Thighs to be parallel to the floor and lower legs to be perpendicular to floor (between 80° and 100°). Thighs may be slightly elevated above knees.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U

Appendix K

		1	2	3	4	5	6	7	8	9	10
1	Forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173° and 183° to pinky knuckle.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
2	Trunk should be perpendicular to the floor.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
3	Both feet rest flat on the floor.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U

Appendix L

		1	2	3	4	5	6	7	8	9	10
1	Head and neck to be upright, or in-line with the torso - not bent down or back. Center-back of head must be no less than 175° from back tip of buttocks	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
2	Trunk should be perpendicular to the floor.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
3	Shoulders and upper arms to be in-line with the trunk/torso, generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outer most part of the back. Top-back of shoulder must be between 175° and 195° to back tip of buttocks.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
4	Forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173° and 183° to pinky knuckle.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
5	Thighs to be parallel to the floor and lower legs to be perpendicular to floor (between 80 and 100 degrees). Thighs may be slightly elevated above knees	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U
6	Both feet rest flat on the floor.	S	S	S	S	S	S	S	S	S	S
		U	U	U	U	U	U	U	U	U	U

Appendix M

Queens College/CUNY

65-30 Kissena Blvd.
Flushing, NY 11367

CONSENT TO ALLOW VIDEO FOOTAGE OF YOUR PARTICIPATION IN A STUDY TAKEN VIA A HIDDEN CAMERA TO BE USED IN A RESEARCH STUDY

Project Title: The Safety Observer Effect Across Various Work Conditions

Project Director/Investigator: Dr. Alicia Alvero, Associate Professor, Psychology Dept., (718) 997-3200

Research/Study Investigator: Adrienne Robek, M.A.

You are being asked to allow video footage that was taken of you via a hidden camera while participating in a research project conducted through Queens College CUNY to be used in a study. If you decide to participate, Queens College requires that you give your signed authorization to participate in this research project.

A basic explanation of the project is written below. Please read this explanation and discuss it with the Research Investigator. If you then decide to participate in the research project, please sign the last page of this form.

Nature and Purpose of the Project:

The purpose of this study is to examine two variables. The first variable is whether conducting observations and collecting safety data on someone engaged in a particular task (typing) in a video tape will increase the safety performance of the observer. The second variable is to see if this effect will vary across three conditions: (1) **alone** condition (where participant types without anyone else in the room (2) **peer** condition (where the participant types with a confederate in the room who is engaged in the same typing task as the participant), and (3) authority condition (where the experimenter comes into the room with the participant, pretends to collect data on the participant and/or confederate for 2 minutes, and then leaves while the participant is working. In other words, will participants' safety performance vary in the presence of other **peers**, in the presence of an authority figure, or when they are working **alone**, *after* conducting safety observations? This scenario is meant to replicate one of an office where the participant represents an employee, the peer confederate represents a co-worker, and the experimenter represents a supervisor. A confederate is someone who works with the experimenter and pretends to be a participant in the study. A confederate is not a research

assistant. It is the hypothesis of the experimenter that (1) safety performance will increase as a result of conducting observations and taking data on the safety behavior of others and (2) safety performance will be greater in the presence of a **peer** or authority figure than it will be in the **alone** condition. All sessions with all participants will be recorded via a hidden video camera. Previous research has shown that people perform more safely after conducting observations but this research is flawed due to the fact that the subjects knew they were being observed. Therefore, it is difficult to speculate whether a similar observer effect would occur if the participants were unaware they themselves were being observed. The present study tries to eliminate that flaw which is why is it critical that the participants do not know they are being observed.

Explanation of Procedures:

You will be given various paragraphs to type on the computer. You will either be alone or with another participant while typing. The maximum number of sessions you will be asked to participate in will be 30 but will not take part in more than 2 per day. Each session will not exceed 30 minutes in duration.

Potential Discomforts and Risks:

The potential discomforts and risks associated with this study are the same ones you would encounter on any given day while doing everyday tasks.

Potential Benefits:

The potential benefit of this study is the opportunity to practice typing.

Costs/Reimbursements:

You will be paid $10.00 per hour ($5.00 per each session).

Alternatives to Participation:

There are no alternatives to participation but you are free to terminate your participation in this study at any time. If you terminate your participation you will still be allowed to keep the money you earned for any time spent in the study.

Termination of Participation:

Participants may be terminated from the study if they fail to show up to 3 scheduled appointments.

Confidentiality:

Names of participants will never be used. Each participant will be assigned a number and will be referred to as that number (e.g. Participant #1). Any data taken on participants will be referred to as: "data for Participant 1." Names will never be used on any documents except for the consent forms. Participants could be identified on the video tapes but only the researchers will have access to the video tapes. The videos will be kept until the study is completed and the findings are disseminated. All documents associated with this study will be kept in Dr. Alicia Alvero's lab in a locked cabinet. The only people who will have access to the video tapes and documents are researchers who have keys for the laboratory (Dr. Alvero, research assistants, and myself).

Withdrawal from the Project:

Your participation in this research project is completely voluntary. You may decide to stop participating in this project at any time without penalty. You are free to leave at any time. If you do not want your video footage and/or data to be used in the study the researcher will destroy it immediately.

Who to Call if you have any Questions:

The approval stamp on this consent form indicates that this project has been reviewed and approved for the period indicated by the Queens College (CUNY) Institutional Review Board for the Protection of Human Subjects in Research and Research Related Activities.

If you have any questions about your rights as a research participant, or to report a research related injury, you may call:

Office of Research and Sponsored Programs, Queens College (CUNY), Telephone # (718) 997-5400.

If you have concerns or questions about the conduct of this research project you may call:

Dr. Alicia Alvero
Associate Professor, Department of Psychology
Queens College (CUNY)
Flushing, NY 11367
Telephone: (718) 997-3200

What Signing this Form Means:

By signing this consent form, you agree to participate in this research project. The purpose, procedures to be used, as well as, the potential risks and benefits of your participation have been explained to you in detail. You can refuse to participate in this study or withdraw from this research project at any time without penalty. Refusal to participate in this study or withdrawal from this study will have no effect on any services you may otherwise be entitled to from Queens College (CUNY). You will be given a copy of this consent form.

_____
Printed Name of Participant

_____ _____
Participant Signature Today's Date

_____
Printed Name of Research/Study Investigator

_____ _____
Signature of Research/Study Investigator Today's Date

Institutional Review Board Approval Stamp:

Appendix N

Debriefing Script

"The first thing I'd like to do is thank you for the time you've spent participating in this study. This study consisted of two different experiments. Experiment 1 examined if (a) conducting safety observations increases the safety performance of the observer and (b) if this effect varies across two work conditions: (1) alone condition and (2) presence of an observer condition. In other words, did participants' safety performance vary in the presence of an observer as compared to when they were working along *after* conducting observations? Experiment 2 examined if (a) conducting safety observations increases the safety performance of the observer and (b) if this effect varies across two work conditions (1) peer condition in which the participant works with a peer confederate in the room and (2) presence of an observer condition. Experiment 2 examined the same variables that Experiment 1 examined in addition to investigating whether or not participants' safety performance varied when the peer confederate was being observed by the experimenter. You took part in Experiment (1 or 2 depending on who the participant is). There was a probe for participants in both conditions every three sessions in which the experimenter came into the room and observed the participant or the peer confederate for two minutes. A peer confederate is a person who works with the experimenter and pretends to be a participant in the study. In other words, the person in the room with you was not really a participant. This scenario is meant to replicate one of an office where the participant represents an employee, the peer confederate represents a co-worker, and the experimenter represents a supervisor. It's my hypothesis that (1) safety performance will increase as a result of conducting

observations and taking data on the safety behavior of others and (2) safety performance will be greater when the experimenter is directly observing the participant and/or the peer confederate. All sessions with all participants are recorded via hidden video camera. In other words, your performance was scored via a hidden camera. Previous research has shown that people perform more safely after conducting observations but that research is flawed because the participants knew they were being observed. Therefore, it is difficult to speculate whether a similar observer effect would occur if the participants were unaware they were being observed. This study tries to eliminate that flaw which is why it is critical that the participants do not know they are being observed.

One of the goals of this study is to determine if the participants are engaging in safe typing behavior. The behaviors we were collecting data on are based on the OSHA Ergonomic Solutions webpage (2003) and are as follows:

1. Head and neck to be upright, or in-line with the torso – not bent down or back. Center-back of head must be no less that 175° from back tip of buttocks.
2. Trunk should be perpendicular to the floor.
3. Shoulders and upper arms to be in-line with the trunk/torso, generally about perpendicular to the floor and relaxed. Must keep elbows to side of body and between front of chest and outermost part of the back. Top-back of shoulder must be between 175° and 195° to back tip of buttocks.

4. Forearms, wrists, and hands to be straight and in-line. Forearm must be between 80° and 100° to the upper arm. Bottom of forearm must be between 173° and 183° to pinky knuckle.
5. Thighs to be parallel to the floor and lower legs to be perpendicular to floor (between 80 and 100 degrees). Thighs may be slightly elevated above knees.
6. Both feet rest flat on the floor.

I'd like your permission to use the data and video footage that were collected during your sessions. Here is what the graphs of your data look like. If you agree to let me use the data and video footage I'll need you to read over this consent form and sign it. If you don't want me to use the data and video footage it will be destroyed immediately. In addition to this, any money you earned by taking part in this study is yours to keep regardless of whether or not you give permission for your data and video footage to be used. Do you have any questions?"

"Once again, thank you for your time."

Appendix O

Exit Interview (Experiment 2)

Below is a list of the questions asked of each participant at the end of the last session and a summary of their answers.

Q1: What did you think was being measured before you started collecting data on the videos? P1a: Speed of typing. P2a: Completing a task. P3a: Speed of typing and how well she performed with other people around her. Also whether or not she typed slower or faster depending on the person she was in the room with (which confederate she was with). P4a: Not sure. Q2a: Did you understand what was expected of you after scoring the videos? P1a, P2a, P3a, and P4a: Yes. Q2b: What did you think was expected of you? P1a: To increase speed of typing as well as type in a safe manner. P2a: Sitting properly, how far away you sit from the keyboard, and posture. P3a: Improving posture. P4a: Supposed to sit in a certain way while typing. Q3: Did you find the information on ergonomics difficult to understand? P1a, P2a, and P4a: No. P3a: A little. Q4: Did you find yourself thinking about body posture when you were being observed? P1a, P3a, and P4a: Yes. Q2a: Only feet position. Q5: Did you find yourself thinking about body posture when you were not being observed? P1a and P3a: Yes. P2a and P4a: No. Q6: While I was observing you, you did not always engage in the ergonomically safe posture I asked you to engage in. What was the reason for this? P1a: It's hard to type and pay attention to posture at the same time. P2a: Sometimes she was tired. P3a: Wasn't aware that she was sitting incorrectly. P4a: Used to sitting with back hunched over. Q7: What did you think the purpose of conducting observations of the videos was? P1a: To have a better

understanding of what your posture should look like and to recognize when you're not sitting correctly. P2a: To remind her of correct posture. That's why it was done right before typing. P3a: To see if she improved her perception of other people's posture as well as her perception of her own posture. P4a: So she could learn the correct way of typing. Q8a: Do you think your behavior changed throughout the course of the study? P1a, P3a, and P4a: Yes. P2a: Not really. Q8b: If so, how? P1a: Now knows there is a safer method to type and it makes it more comfortable to type. P3a: Focused more on posture than on speed of typing. P4a: Her posture changed a little. Q9: Your performance was unstable at times during the study. In other words, sometimes your body posture was safe while at other times it was unsafe. Why do you think this occurred? P1a: More comfortable to type with unsafe posture than with safe posture. P2a: Posture varied with time of day. Task was monotonous. P3a: Wasn't always focused on posture. Sometimes she focused on speed of typing. P4a: Didn't always realize posture was unsafe. Q10: Was there anything that you said to yourself while you were being observed? P1a: Was thinking about her posture. P2a: No. P3a: Wondering what the study was about. P4a: Thinking she should sit correctly so she could leave 10 minutes early. Q11: Was there something that you said to yourself each time you conducted an observation of the videos? P1a: Kept telling herself to sit up straight. P2a: The person in the video reminded her of someone. P3a: Wondering if she was measuring the body measurements properly. P4a: No. Q12a: Do you think conducting observations of the videos changed your performance? P1a, P2a, P3a: Yes. P4a: Only when she was being observed. Q12b: If so, how? P1a and P3a: Became aware of how she was sitting. P2a: Reminded her to keep her feet flat on the floor. P4a:

Posture was better while being observed. Q13: Were you comfortable having the experimenter observe your behavior? P1a and P3a: No. P2a and P4a: Yes. Q14: Did you put any pressure on yourself to perform well? P1a: With typing but not with posture. P2a: Yes, with typing and feet position. P3a: Yes. P4a: Yes but only while being observed. Q15: Do you feel that the experimenter put any pressure on you to perform well? P1a: With typing but not with posture. P2a and P3a: No. P4a: Only when she had the option to leave 10 minutes early. Q16: Do you feel that you would have performed more safely throughout the entire study if the experimenter had given you feedback on your performance throughout the entire study? P1a: Not really because she knew what she was doing wrong but didn't fix it because she was so focused on typing. P2a, P3a, and P4a: Yes. Q17: What would have helped you be more safe, or motivated you to be more safe? P1a: Seeing a video on the consequences of not typing safely (i.e., back problems, carpal tunnel syndrome). P2a, P3a, and P4a: Nothing Q18: Do you feel that you would have performed more safely if there were monetary consequences in place for doing so? P1a: Yes. P2a and P3a: No. P4a: Yes, but only if she was being observed.

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