The Effects of Altering Response Effort During Data Collection on Observer Accuracy: Data Collection Procedures on Hand Hygiene Compliance

Krista Hinz
Western Michigan University

Follow this and additional works at: https://scholarworks.wmich.edu/masters_theses
Part of the Industrial and Organizational Psychology Commons

Recommended Citation
https://scholarworks.wmich.edu/masters_theses/91

This Masters Thesis-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Master's Theses by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.
THE EFFECTS OF ALTERING RESPONSE EFFORT DURING DATA COLLECTION ON OBSERVER ACCURACY: DATA COLLECTION PROCEDURES ON HAND HYGIENE COMPLIANCE

by

Krista Hinz

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology
Advisor: Heather M. McGee, Ph.D.

Western Michigan University
Kalamazoo, Michigan
December 2012
THE EFFECTS OF ALTERING RESPONSE EFFORT DURING DATA COLLECTION ON OBSERVER ACCURACY: DATA COLLECTION PROCEDURES ON HAND HYGIENE COMPLIANCE

Krista Hinz, M.A.
Western Michigan University, 2012

When dealing with human observers and error, tight control in data collection and methodology is essential for accurate representation of compliance. Although observational studies are popular, little has been done to study the integrity of human observers and the data collection process. Incomplete analysis of data collection integrity threatens functional findings, leading to problematic interpretation and decreased replication. The purpose of the current study was to assess whether manipulating the response effort associated with data collection has an effect on the accuracy of data collection. Participants of the study were undergraduate psychology students at a Midwestern university who were enrolled in an undergraduate I/O practicum that took place at a local hospital. To examine and counterbalance the effects of manipulating response effort, an ABAB/BABA design was implemented across two semesters. Initial results from visual inspection of the data demonstrate that with the exception of change between phase one and two during the first semester, all subsequent phases in the first semester and all phases in the second semester generated a visually salient change in data collection behavior when response effort was manipulated. Despite visual changes in the data, statistics failed to demonstrate a generalizable effect.
ACKNOWLEDGMENTS

First and foremost, I would like to thank Dr. Heather McGee. Throughout my undergraduate and graduate career, she has been an unmitigated source of wisdom, direction, and leadership. I greatly respect and admire her academic, career, and life accomplishments and am very blessed to call her my advisor. She is my champion, confidant, and inspiration. I am unable to adequately articulate the depth of my appreciation but instead will say that my success is her success, and for it and her, I will always be grateful.

Second, I would like to thank Dr. Alyce Dickinson for her guidance academically and with the practicum. Dr. Dickinson is a great resource for problem solving and always knows just what to say/do when situations become “sticky”. She always has a thoughtful word of praise and a chuckle to brighten my day.

Dr. McGee and Dr. Dickinson are always available to help with a quick and genuine smile. I treasure the opportunities both have afforded me, and also the knowledge they have imparted.

Third, I would like to thank my thesis committee: the aforementioned Dr. McGee and Dr. Dickinson, and in addition, Dr. Richard VanEnk. Their willingness to be on my committee, in addition to the time and consideration they gave to my research, is much appreciated. The gift of their combined experience was a kind contribution.
Acknowledgments—Continued

Fourth, I would like to thank my research assistants, Jerrad Yaw and Nickolas Spelde. They started out as great students and ended up being spectacular and generous research assistants. Their voluntary dedication to learning and my research is recognized and valued.

Last, but certainly not least, I would like to acknowledge my family. I want to thank them for my weirdness, paranoia, and divergent humor. I also want to thank them for their boundless, unconditional, and beautiful love. If I shine, I shine through them. Their love and support carries me further than they know.

Krista Hinz
# TABLE OF CONTENTS

ACKNOWLEDGMENTS ............................................................................................................. ii
LIST OF FIGURES .................................................................................................................... v

## INTRODUCTION ............................. 1

- Hand Hygiene Programs ............................................................................................... 3
- The Industrial/Organizational Psychology Hand Hygiene Practicum ...................... 14
- The Current Study ......................................................................................................... 17

## METHOD ........................................... 18

- Participants ..................................................................................................................... 18
- Setting ............................................................................................................................. 19
- Apparatus and Materials .............................................................................................. 20
- Dependent Variable ....................................................................................................... 21
- Mathematical Calculation of Percent Compliance ..................................................... 22
- Independent Variable .................................................................................................... 22
- Experimental Design ..................................................................................................... 23
- Procedures ....................................................................................................................... 23

## RESULTS .............................................. 26

- Descriptive Statistics ................................................................................................. 26
- Inferential Statistics ...................................................................................................... 27

## DISCUSSION ........................................... 29

## REFERENCES ........................................... 32

## APPENDICES .............................................. 46

- A. Hand Hygiene Graphical Feedback ........................................................................ 46
- B. Hand Hygiene Auditing Tools ................................................................................ 50
- C. Job Aid ....................................................................................................................... 53
- D. HSIRB Approval Letter .......................................................................................... 55
- E. Syllabus/Student Signature Form ............................................................................. 57
LIST OF FIGURES

1. Percent compliance across phases in semester one................................. 26
2. Percent compliance across phases in semester two ............................... 27
INTRODUCTION

As early as 1546, it was theorized that disease was contagious and was transferred via "particles" from one person to another (Wainwright, 2003, p. 334). Along with this postulation by Geronimo Fracastorius, others along the way supported the contagion theory, but were unable to pinpoint exactly how illness was transferred. Although transmission of disease by hands was recognized by Alexander Gordon in 1795 and Oliver Wendell Holmes in 1843 (Rotter, 2004, p. 1727), isolating hand hygiene as a causal variable for hospital acquired infections (HAIs) was not demonstrated until the late 1840s by Ignaz Semmelweis, a Hungarian physician at the University of Vienna, Austria. Through one of the first statistical analyses in the medical field, Semmelweis was able to garner empirical support attributing the transmission of disease, specifically puerperal fever, to the unclean hands of healthcare workers (HCWs) (Broemeling, 2003; Miller, 1982). Lyons and Petrucelli (1997), provided further support, stating that "Semmelweis may be credited with having for the first time constructed a statistically tested system of asepsis (keeping germs away from the patient) before the germ theory had arrived" (p. 553).

Semmelweis first began his research in 1846 after noticing high rates of mortality in a maternity ward where physicians and residents assumed care of patients after working on cadavers. The physicians and residents would wash their hands using soap and water, but Semmelweis was quick to note that the smell of the cadavers was still present after washing, and that disease may still have been present on the hands of the physicians and residents.

Unlike the aforementioned ward, a nearby maternity ward staffed by midwives who were not part of the cadaver lab had low rates of mortality. After an 18.2% mortality
rate in April of 1847, Semmelweis intervened with an antisepsis technique that required physicians and residents to wash with a chlorinated solution after working on cadavers. This procedure was implemented in mid-May of 1847. In 1848, when the antisepsis technique had been used throughout the whole year, mortality dropped to 1.9% (Semmelweis, 1861/1983). Germ theory of disease was then confirmed in the 1870s and 1880s through a set of experiments by Robert Koch and Louis Pasteur (Murray, Rosenthal, & Pfaller, 2008, p.3). Hand hygiene was, and still is, the most important practice for preventing the transmission of HAIs. However, despite all we have learned through research and technological contributions since transfer of disease was first postulated, hand hygiene compliance still remains a problem.

The term hospital-acquired infection refers to the transfer of contagions, or microorganisms, through medical procedures or from the use of medical devices, that were not present or incubating at the time of admission. In 2002, an estimated 1.7 million patients in the United States acquired an HAI and, of those, an estimated 99,000 patients died as a result of the infections. This situates HAIs as the 5th leading cause of death in American acute care hospitals (Klevens et al., 2007). Research validates that HAIs decrease as compliance to hand hygiene protocol increases (Boyce & Pittet, 2002; Larson, Early, Cloonan, Sugrue, & Parides, 2000; Pittet et al., 2000). Research further suggests that infection rates can be decreased by 33% with compliance to hand hygiene protocols (Creedon, 2006; Haley et al., 1985; Pittet et al., 2000). The Institute for Healthcare Improvement (2006) delineates:

Transmission of health-care-associated pathogens most often occurs via the contaminated hands of health care workers. Accordingly, hand hygiene
(i.e., hand washing with soap and water or use of a waterless, alcohol-based hand rub) has long been considered one of the most important infection control measures for preventing health-care-associated infections (p. 3).

Although hospitals have long had policies requiring HCWs to use hand hygiene between patients, reported compliance rarely exceeds 50% (Gilbert, Stafford, Crosby, Fleming, & Gaynes, 2010).

**Hand Hygiene Programs**

Most hospitals are now implementing programs to measure and improve hand hygiene compliance. In addition to the social significance of increased quality of care and safety to patients and HCWs, reducing HAIs decreases financial loss for the organization. In 2007, additional treatments and longer hospital stays resulting from HAIs were responsible for an estimated $28.4 to $33.8 billion in extra healthcare costs (Scott, 2009). Unfortunately, most interventions on hand hygiene compliance have short-lived success. To be effective, the program must become part of a permanent practice (Pittet et al., 2000). Furthermore, to obtain long- or short-term success, the program must have administrative support. Providing a bolster of administrative support aids the intervention program by ensuring that change will take effect via consequential action. The naturally occurring consequences for engaging in hand hygiene within hospitals are often punishing and ineffective. To follow suggested protocol, staff must utilize hand hygiene frequently. To do so requires response effort, interruptions in routine, and time away from patients or other tasks. In addition, frequent hygiene increases dry and chapped hands which is physically aversive. These consequences are immediate and punishing. Escape from negative covert verbal behaviors surrounding perceptions of infection and
personal hygiene may seem to provide reinforcement, but the probability of microbial
transmission is perceived as unlikely. Furthermore, unlike a medication error, it is
unlikely that the consequence of patient harm from contaminated hands will be connected
back to the HCW responsible. Without this feedback, those crucial negative covert verbal
behaviors are unlikely to occur. Additionally, the existing environmental contingencies
from the organization, social approval or disapproval, are not probable or valuable
enough to control the behavior. To evoke change, organization-wide consequences need
to be established that will support hand hygiene behaviors. To ensure that they are
enacted, high levels of administrative support must be employed.

Another problem with current hand hygiene programs is the lack of uniformity in
the dissemination of results due to varied data collection procedures and methodology.
Operational definitions of what does and does not constitute a hand hygiene opportunity
differ, as do the data collection methods. Boyce and Pittet (2002) noted that in addition to
varied methods and criteria used, reported research does not convey specifics of their
components. This may contribute to difficulties with operational definitions and
discernment of auditing opportunities.

Direct observation is commonly used to audit hand hygiene behavior and
although it is considered to be paramount when compared to other methods of data
collection, such as self-reporting, there are drawbacks. A distinct disadvantage to direct
observation is reactivity to the auditor. When HCWs are aware they are being watched,
they may change and/or correct behavior. Additionally, it is common practice for
management to use HCWs to collect compliance data sporadically or at specified times
during a shift. This can be problematic if staff are not trained to collect data, or are
trained differently from one another. Furthermore, using preexisting staff to audit the hand hygiene behavior of other employees introduces the potential for biased data. Falsification of data may result from negative treatment by peers, pressure from the organization to do well, and/or punishing consequences that may fall on a particular department, or the organization as a whole, for results that do not meet a set goal. Falsification and/or withholding data prevents an accurate representation of the organization’s hand hygiene behavior and fails to identify areas that need improvement.

When dealing with human observers and error, tight control in data collection and methodology is essential for accurate representation of compliance. Inconsistent and inaccurate measurement of adherence results in reports that are questionable, making comparisons of organizational compliance between institutions difficult.

**Hand Hygiene Interventions.** Hand hygiene interventions range from manipulating the physical environment of the healthcare facility to interventions on HCWs. Research conducted on the physical arrangement of the work environment within healthcare facilities has identified barriers to hand hygiene. Interventions on HCWs have studied the effects of informative stimuli, goals, and consequences on hand hygiene compliance.

**Environmental interventions.** Environmental interventions modify the physical environment via restructuring and retrofitting. These interventions consider the physical arrangement of the work environment relative to the job process of the employee. They further take into account innovations in technology created to improve these processes. The availability and specific placement of sinks, along with the installation of alcohol-based hand sanitizer (ABHS) dispensers, are common adaptations within environmental
Interventions. Easy access and specific arrangement of sinks and ABHS dispensers have been shown to increase compliance of hand hygiene protocol (Bischoff, Reynolds, Sessler, Edmond, & Wenzel, 2000; Boyce & Pittet, 2002; Giannitsioti et al., 2009; Preston, Larson, & Stamm, 1981; Whitby, McLaws, Slater, Tong, & Johnson, 2008).

Sink placement. As an intervention, accessibility of sinks to facilitate hand hygiene have resulted in regulation change to hospital construction; placement of sinks in every room is now standard. Hand washing is a form of hand hygiene that utilizes soap and water to remove transient flora and visible dirt which may provide a breeding ground for pathogenic microorganisms. Dirt, along with transient microorganisms, are physically loosened during hand washing by rubbing hands together for a minimum of 15-20 seconds. The loosened bacteria are then rinsed off the hands. Although ABHS works well for denaturing many pathogenic microorganisms, they are ineffective against spore bacteria such as Clostridium difficile, and physical removal with soap and water is needed.

Alcohol-based hand sanitizers. Alcohol-based hand sanitizers (ABHS) aid in preventing the transmission of potentially dangerous microorganisms (Boyce & Pittet, 2002; Ehrenkranz & Alfonso, 1991; Mackintosh & Hoffman, 1984; Marples & Towers, 1979), and increased use reduces HAIs (Pittet et al., 2000). Alcohol-based hand sanitizers are typically composed of 60%-95% ethanol or isopropanol. The alcohol operates by penetrating and denaturing the proteins and enzymes inside microorganism cells, reducing the count of viable microorganisms present on the hands of HCWs. As Semmelweis demonstrated at the University of Vienna, antisepsis techniques are
successful with reducing HAIs, and are more effective than washing with soap and water (Broemeling, 2003; Miller, 1982; Semmelweis, 1861/1983).

Several studies have shown the success of alcohol in decreasing microbial counts on hands (Boyce & Pittet, 2002; Pohle & Stuart, 1940; Price, 1938, 1939). In a review of the literature comparing ABHS with soap and water, Boyce and Pittet (2002) concluded that ABHS is more effective at decreasing microbial counts on hands. Furthermore, ABHS reduces counts of antimicrobial-resistant organisms more effectively than soap and water (Boyce & Pittet, 2002; Casewell, Law, & Desai, 1988; Gordin, Shultz, Huber, & Gill, 2005; Huang, Oie, & Kamiya, 1994; Wade, Desai, & Casewell, 1991). In addition to being more efficient with decreasing microbial counts, ABHS is less irritating and less time consuming (Bischoff et al., 2000; Boyce & Pittet, 2002; Brown et al., 2003; Harbarth et al., 2002; Larsonet al., 2001; Marena et al., 2002; Maury et al., 2000; Trampuz & Widmer, 2004; Voss & Widmer, 1997). Use of ABHS eliminates steps within the process of hand hygiene, decreasing time spent on the process. To effectively wash with soap and water, the HCW must engage in the behavior for a minimum of 15-20 seconds for the behavior to be beneficial. With ABHS, the worker is able to attend to his or her next task as soon as the product is rubbed in and dried. This is often completed while the HCW is en route to his/her next task.

Despite ease of use and efficacy of ABHS, hand hygiene compliance is still universally low. A study by Graham (1990) demonstrated that implementation of an antiseptic lotion on a low-compliance intensive care unit increased compliance 13%, but even with the increase, compliance was still worrisome at 45%.
Interventions on HCWs. Many interventions have examined altering antecedents and consequences to improve hand hygiene compliance. Manipulation of stimuli preceding or following behavior increases performance by prompting and/or giving information on the desired performance (antecedent), and also by providing a reinforcing or punishing consequence that will increase or decrease future frequency of the target behavior.

Behavioral interventions have included education, feedback, goal-setting, and behavioral consequences. Supplying the HCW with antecedent information regarding the rationale, the definition, the history, the expectations, and the ensuing consequences of the desired behavior promotes optimal operation on the part of the HCW. In turn, placing a consequence on the behavior supports future likelihood that the behavior will continue or be suppressed.

Education. Educational sessions and pamphlets have been used to increase compliance. These antecedent interventions focus on the rationale for engaging in compliant hand hygiene behavior that include the risks and benefits, costs, and further education on guidelines and techniques (Colombo et al., 2002; Creedon, 2006; Gould & Chamberlain, 1997; McGuckin, Taylor, Martin, Porten, & Salcido, 2004; McGuckin, Waterman, & Govednik, 2009; Panhotra, Saxena, & Al-Arabi, 2004; Shaw & Tanner, 2003; Tibballs, 1996). However, the results of these studies indicate that education as the sole intervention has little effectiveness and maintenance (Naikoba & Hayward, 2001; Ockene & Zapka, 2000).

Feedback. Individual and group feedback has also been used as an intervention on compliance with mixed results (Assanasen, Edmond, & Bearman, 2008; Bittner, Rich,
Turner, & Arnold, 2002; Marra et al., 2008; Moongtui, Gauthier, & Turner, 2000; van de Mortel & Heyman, 1995; van de Mortel et al., 2000). For instance, in a study by Marra et al. in 2008, two step-down units (SDUs) were compared. In one unit, a nursing supervisor presented individual feedback on dispenser use to employees twice weekly along with target goals and process measures. In addition, individual employee numbers were placed in medical charts along with the numbers of their peers for comparison. In the second unit, the control, no feedback was given. There was no significant effect between the intervention and the control unit.

In a study by Bittner et al. (2002) an estimate of hand hygiene compliance in two intensive care units (one an intervention unit and one a control unit) was measured through paper towel and soap dispenser usage. In addition to this measure, live observers collected real-time hand hygiene behavior data in both units during baseline and follow-up phases. Live observers were only present during the baseline and follow-up phases.

During the intervention phase, graphical group feedback was posted on estimated compliance based on paper towel and soap dispenser usage per occupied bed per hour for the previous 5 weeks. The intervention unit continued the graphical feedback throughout the follow-up period. No graphical feedback was posted in the control unit. The intervention unit showed a transient increase in the estimated usage of paper towels and soap mid-way through the intervention that eventually decreased. In the control unit, the estimated usage of paper towels and soap decreased during the intervention phase. There was no change in procedures during follow-up other than the re-introduction of live observers. Compliance in both units increased after the reintroduction of live observers, but in both units the data were not significantly different from baseline.
Treatment packages. Balcazar, Hopkins, and Suarez (1985/1986) demonstrated that feedback alone does not produce consistent results and, further, that the consistency of effects are improved when feedback is paired with additional treatments. These findings were replicated by Alvero, Bucklin, and Austin (2001). To bolster treatment effects, some hand hygiene studies have employed treatment packages that include combinations of education and feedback. Research conducted by Rosenthal, McCormick, Guzman, Villamayor, and Orellano (2003) demonstrated that education is more effective when combined with feedback. In that study, hand hygiene protocol was examined within three hospitals. An ABC design was employed. During the first intervention phase, an infection control manual was used, specifically the hand hygiene section, as a teaching guide every day for a week. Participation in the education sessions was voluntary. During the second intervention phase, performance feedback was added into the education sessions. Infection prevention personnel observed and documented the hand hygiene of staff. Bar charts were then created and distributed to managers to be discussed during meetings and posted within the units. At baseline, hand hygiene compliance was 17%. With education, it increased to 44%, and with a combination of education and feedback, it increased to 58%.

Dubbert, Dolce, Richter, Miller, and Chapman (1990) showed similar results after employing education and feedback in an intensive care unit. Following baseline, education (consisting of four 15-minute sessions over a span of a week) was implemented. The education was scheduled to include all staff and included a review of critical procedures involving hand hygiene along with a rationale for hand hygiene. After this phase, hand hygiene increased from a baseline of 81% to 94% during the first week.
However, during the three weeks following the intervention, compliance gradually dropped back to baseline levels. After the education phase, feedback was implemented for the final four weeks of the study. On observation days, a form denoting performance for the previous day was posted for staff to view. Specifics about errors were included, but individual subjects were not identified. By the second week of feedback implementation, compliance increased to 97% and maintained for the remaining two week duration of the study.

**Methods of Data Collection.** Several methods have been used to collect data on hand hygiene compliance. Methods consist of: direct observation, self-monitoring, measurement of product usage, and electronic sensoring.

**Direct observation.** Direct observation of hand hygiene behavior is optimal because it allows us to see the hand hygiene behavior as it is occurring (Earl, Jackson, & Rickman, 2001; Gould, Chudleigh, Moralejo, & Drey, 2007; Larson, Aiello, & Cimiotti, 2004). We can observe the process to see when the HCW is noncompliant. This can include information on barriers within a patient environment, compliance data on hand hygiene behavior that occurs before and after the HCW contacts a patient environment, and also other compliance data on other interactions within a patient environment. In addition to informative specifics, direct observation also allows the opportunity for presenting HCWs with immediate feedback and education. With direct observation, we can pinpoint where education or system improvement may help.

Despite the aforementioned benefits, there are drawbacks to direct observation. Although some hospitals utilize volunteers to conduct observations, many rely on employed staff members. In addition to costs that need to be budgeted for staff observers,
the lack of universal standardization of the auditing process, an overarching problem with auditing programs, is also problematic within the data collection process. Differing methods may infer varying levels of stringency within the data collection process. The training and experience of the observers may differ, and operational definitions between organizations may differ.

Further, there may be varying degrees of staff reactivity to the auditor, depending on the covertness of the individual auditing process. Although the Centers for Disease Control and Prevention have recommended guidelines for hand hygiene compliance (Centers for Disease Control and Prevention, 2007), hospitals differ in their specific protocols. It is also important to note that relative to all opportunities that occur, only a small fraction is observable and may not be representative of the population norm (Boyce, 2008; Haas & Larson, 2008; Larson et al., 2004; McAteer et al., 2007).

**Self-monitoring.** Self-monitoring compliance data requires the HCW to monitor his or her own performance. This removes the need for allocation of resources and additional expenditures as auditors and other associated organizational costs are removed. However, research has been unable to support the efficacy of self-monitoring in the workplace when used independently of other intervention components (Olson & Winchester, 2008).

Another concern with self-reporting is the accuracy of the reported data. When consequences are tied to self-monitored data, motivating variables may influence responding (Austin, Olson, & Wellisley, 2001). Further, studies show that employee perceptions are not always accurate (Krause, 1997; McCann & Sulzer-Azaroff, 1996). In a study examining self-reported hand hygiene compliance, Weinstein (2001) found that
HCWs estimated their own compliance to be at 85%. They further estimated the compliance of their co-workers to be 51%. Actual observed compliance was only 28%, demonstrating a difference between perceived and actual performance.

**Measuring product usage.** Measurement of product usage has also been examined in hand hygiene research. Calculations based on the patients and their needs inform a base-rate of hand hygiene that is needed for compliance. For example, typically with admitted patients, vitals such as blood pressure and heart rate are taken every two hours. If these vitals are taken manually by a HCW, there would be a minimum expectancy of 24 opportunities for hand washing in a 24-hour period. That is, if a HCW enters a room for vitals every 2 hours, and the HCW is expected to wash before going in and after coming out, at the end of the day vitals would have been collected 12 times resulting in 24 opportunities for hand hygiene. This would be a minimum expectancy as it only includes when an HCW has opportunities to wash during vitals. This does not include all other opportunities such as giving medications, checking machines, etc. The product is then measured to gauge compliance. A drawback to product measurement is hyper-use of product by employees to manipulate an increased compliance. This can be remedied by the addition of delay tickers. Another drawback is that measurement of product usage does not take into consideration occurrences outside of necessary instances of hand hygiene.

**Electronic sensoring.** Electronic sensoring relies on technology to measure hand hygiene. Measures of hand hygiene behavior are electronically tracked via implementation of sensor units inside the patient rooms. These sensors attach to the patients' beds, ABHS units, soap dispensers, and doors. Data on hand hygiene behavior
are measured by the HCWs physical approximation to the sensor unit and/or patient. Data are collected on when the HCW engages in hand hygiene behavior and when the HCW fails to engage in hand hygiene behavior within a predetermined space of time. In addition to collecting data, the sensors also serve as environmental prompts. The sensors alert that an opportunity for hand hygiene behavior is present by a visual or audible prompt that may entail a small flashing light or an audible “beep”. Because it is a recent innovation, research is limited. Forgetfulness is a commonly stated reason for noncompliance. In a study conducted across four Veteran Affairs ICUs, Eldridge et al. (2006) noted that 44% of HCWs reported forgetfulness as a reason for not practicing hand hygiene. Prompts provided by electronic sensors, then, should work to increase hand hygiene because these prompts act as antecedent stimuli to signal the opportunity for hand hygiene. However, when trying to create a calm environment conducive to healing, visual and audible prompts may be aversive to patients.

Another benefit to electronic sensoring is the ability to collect data on behavior that may not be observable with direct observation. However, a downfall is that most electronic systems monitor only the ABHS, not the sink. As such, data may be inaccurately reported if the HCW utilizes the sink to wash instead of the ABHS. Further, they are unable to record peculiars of hand hygiene such as hygiene taking place before and after gloving and HCWs that enter and leave the room without touching anything. While collection of all hand hygiene behaviors may seem to be ideal, direct observation and inferential statistics may lend more quality information with similar results.

The Industrial/Organizational Psychology Hand Hygiene Practicum

A program to decrease HAIs by increasing compliance of hand hygiene was implemented at a hospital in the Midwest. To assist with data collection and
implementation, the hospital teamed up with a local university’s psychology department to offer a practicum opportunity for upper-level undergraduate students majoring in psychology and, in particular, students interested in Industrial/Organizational (I/O) psychology. The practicum was supervised by the author who was working as a healthcare administrative intern within the infection prevention department at the hospital. In addition, the author was also a graduate student in the university’s I/O Master’s Program.

Each semester, students within the practicum collected data on compliant and noncompliant behavior within the patient care units of the hospital. The data were then analyzed and the units were provided with graphical feedback denoting the unit’s sample size of audits and percentage of compliance. (See Appendix A). The units were further presented with a breakdown of the types of employees audited (e.g., Registered Nurse, Patient Care Assistant, Lab, etc.), the shift, weekday vs. weekend, yearly, and quarterly data.

**Data Collection Issues.** The practicum offered a dual advantage in that it collected data on employee delivery of safe healthcare, while also offering students at the university the experience of performing behavioral observations and data collection in an applied setting. Not unique to this practicum is that many applied sciences use human observers as a means of data collection. Research on the utilization of human observers cautions the researcher to ensure the observers are conducting accurate observations. Factors such as reactivity, observer drift, the recording procedure, reliability, complexity and demands of the task, subject and setting may all compromise the data collection
practice (Brusca, Nieminen, Olinger, & Repp, 1988; Kazdin, 1977; Mash & McElwee, 1974; Spano, 2005).

Whereas observational studies are popular, little has been done to study the integrity of human observers and the data collection process, aside from employing interobserver agreement (IOA) procedures. Energy is typically focused on treatment integrity by making sure the intervention was implemented as planned. Even then, the assessment of treatment integrity has been relatively low (Gresham, Gansle, & Noell, 1993; Peterson, Homer, & Wonderlich, 1982; Sass, Twohig, & Davies, 2004).

Integrity of both the independent and dependent variables is essential to research in behavior analysis. Incomplete analysis of their respective integrity threatens functional findings, leading to problematic interpretation and decreased replication.

**Response effort.** In addition to the aforementioned data collection issues, another variable that may have been affecting the integrity of the data collection process in place at the site of the current study is that it required more response effort to mark a noncompliant occurrence than it did to mark a compliant occurrence. There is little applied research investigating the effects of response effort on responding when given choice between two responses. However, basic experimental research has shown that if an organism is presented with two choices that have the same outcome, but with differing response efforts, the organism will choose the less effortful response (Baum, 1974; Billington & DiTommaso, 2003). Research further demonstrates that response rates decrease as response effort increases (Alling & Poling, 1995; Chung, 1965; Fisher & Mazur, 1997).
Differing response efforts in data collection is not uncommon. For example, when collecting data on the occurrence of a behavior, negative or positive, there is response effort for collecting data on the target behavior—but little or no response effort for collecting data on the absence of the behavior. The occurrence of the behavior may require the observer to record times, dates, settings, antecedents, and consequences. Further, the collection of longitudinal data may be subject to increased fatigue and lax practices by the observer. To promote optimal data collection, response dimensions, specifically response effort, should be equal across all levels of responding. When response effort differs between two choices, every effort should be made to decrease the response effort associated with the more difficult task (Bailey & Burch, 2002). However, this is not always possible. In the current study, it was not practical to decrease the response effort associated with recording noncompliant data. Therefore, an increase in response effort associated with recording compliant data was manipulated.

The Current Study

The purpose of the current study was to assess whether increasing the response effort associated with marking compliance to match that associated with marking noncompliance would improve the accuracy of data collection. To the author's knowledge, there is little research on data collection integrity and no research on manipulating response effort to increase validity of data collection measurement.
METHOD

Participants

Participants of the study were undergraduate psychology students at a Midwestern university who were enrolled in an undergraduate I/O practicum that took place at a local hospital. The study spanned a 1-year time period, encompassing three semesters. A total of 9 undergraduate students across 3 semesters agreed to participate in the study and were chosen, by interview, from the university's psychology department to collect data on hand hygiene behaviors at the hospital. There were 3 students the first semester, 2 students the second semester, and 4 students the third semester. Data from the second semester were not included in the study because the sample of data collected by the students was unusually small and visual inspection was concerning. Typically with concerns following inspection of low sampling and values, feedback and one-on-one time is provided. However, because they were collecting data for research, the author thought it best not to employ feedback. Singling out the data from the control unit during this semester resulted in a total of 84 observations across all phases. Only 2 of the observations were noncompliant, both occurring on the same day during the first phase. All subsequent audits were documented as compliant.

All participants received undergraduate practicum credit toward their degree in psychology. As students of the practicum, the participants were required to complete 13 hours of practicum work each week, which consisted of ten hours of data collection, two hours of off-site research, and a one-hour weekly meeting. All participants had taken courses in research methods and concepts and principles of behavior analysis. Additionally, preference was given to participants who had taken additional courses in organizational behavior management and behavior analysis. The participants directly
observed patient care units at the hospital, documenting compliance and noncompliance of the employees using an audit tool (Appendix B). Because of hospital policy involving patient privacy, the participants were required to become volunteers before they could have access to the patient care units. The auditing process took place across all days and all shifts, within 22 patient care units.

In addition to their tour of the hospital given through volunteer orientation, the participants were given a two-hour tour by the graduate student supervisor. At this time, participants were prompted to identify compliance and noncompliance on the units. In addition to identifying compliance on the units, the participants were taken to a clinical training lab that was set up like a patient room. The graduate supervisor enacted scenarios where the participants were again prompted to identify compliance and noncompliance. The students were also given maps of the hospital and instruction on the use of the auditing tool. Furthermore, a job aid (Appendix C) located on the back side of each auditing tool denoted which units to audit, which rooms were included in each unit, the types of employees audited, and a description of the color-coded scrubs worn by the differing types of employees.

**Setting**

The setting was a 404 bed hospital located in the Midwest, encompassing 23 acres. The hospital is the flagship of a healthcare group, which also includes a multitude of other hospitals, clinics, and medical specialty centers. The hospital consists of a north and south campus comprising 22 units with a total of 404 private rooms. Private rooms not only offer increased patient privacy, but they also contribute to a reduction in HAIs (Detsky & Etchells, 2008). The private rooms contain a bed, a portable side-table, a
night-stand, a television, a chair, built-in closets, a sink, a pump soap dispenser, a metal paper towel dispenser, a Purell® sanitizing foam dispenser, a garbage can, and various types of equipment suited for patients' individual needs. Topographically, all the rooms are similar except for entrances, which differ across and within units to include: curtains, wooden doors, sliding glass doors, or a combination of door and curtain.

**Apparatus and Materials**

**Hand Hygiene Auditing Tool.** The Hand Hygiene Auditing tool (Appendix B) was used to collect data on compliance. The tool was the size of a standard sheet of white paper (approximately 8.5 x 11 inches) and included a left-sided header to identify the tool, along with a space for the participant to document name, time, and date. Also included on the right side of the header was a space for the participant and/or research assistant to document whether the data was for IOA purposes, and the name of the auditor IOA data was collected with. A table of cells ran vertically down the page where the collected data were recorded. Cell categories included: unit, type of employee, if the observation took place before or after an opportunity for compliance, if the employee was compliant or noncompliant, what was touched by the employee, room number, if the hand hygiene opportunity took place inside/outside of the room, and a comment section. The back of the audit tool doubled as a job aid. Two tables ran vertically down the back. The first denoted the units, their abbreviations, and room numbers. The second denoted employee types, their abbreviations, and uniform descriptions. This helped to ensure the data corresponded to the correct units and employees. The research assistants were given the same tool for IOA. The auditing tools were modified slightly during the intervention phases to aid as a visual reminder of changes in the auditing process. During the
intervention phases, the tools were printed on blue paper and the cell category for what was touched in the room was changed from “if no, what was touched” to “touched”. In addition to the intervention tools, the web application used by the participants to enter data was modified. During the baseline phases, the web application was adjusted so that students would not be able to progress to the next ticket until they marked what was touched for noncompliance. During the increased response effort phases, the web application was again adjusted so that the students would not be able to progress until they entered what was touched for compliance, in addition to what was touched for noncompliance.

**Dependent Variable**

The dependent variable was a measurement of the percentage of opportunities for hand hygiene marked as compliant by the participants. The data were obtained from the data collection sheets completed by the auditors. After each auditing session, the participants entered the data into the web application. Compliance was calculated as the number of compliant audits divided by the total number of compliant and noncompliant audits.

To ensure the validity and reliability of the data, the participants collected interobserver agreement (IOA) data with each other or a research assistant for 35% of the observation sessions and obtained 98% agreement. The percentage of IOA was calculated by dividing the total number of agreements by the total number of agreements and disagreements.
Mathematical Calculation of Percent Compliance

In addition to assessing the validity and reliability of the data collection process, IOA was conducted on the measure of the proportion of total hand hygiene compliance. Compliance was calculated by the participants by dividing the number of compliant audits by the total number of compliant and noncompliant audits. IOA on these calculations was completed by the author, along with a research assistant, for a 35% of all observation samples, obtaining 99% agreement. The percentage of IOA was calculated by dividing the total number of agreements by the total number of agreements and disagreements.

Independent Variable

During the intervention phase of the experiment, the response effort of collecting compliance data was increased to match the response effort associated with collecting noncompliant data. As it was, it required more response effort to document noncompliance than it did to mark compliance. To mark compliance, the participants had to observe the HCW engaging in proper hand hygiene behavior. To mark noncompliance, they were required to observe the HCW physically contacting the patient environment without engaging in hand hygiene and, in addition, record what the HCW touched in the patient's environment. In the intervention condition, the participant had to visually identify and record what the HCW touched in the patient care environment before marking compliance as well as noncompliance. The web application was adjusted so that the students would not be able to progress until they entered what was touched for compliance, in addition to what was touched for noncompliance. That is, during the first "easier" condition there were 2 choices. Marking compliance was less effortful. To do so,
the auditor only needed to observe the employee engaging in proper hand hygiene behavior. Marking a noncompliance in this phase was more effortful because the auditor had to observe what the HCW touched and record it. During the increased response effort intervention phase, the auditor had to mark compliance status as well as what the HCW touched during both compliant and noncompliant audits. This equalized the response effort of both choices, removing the possibility of a less effortful response.

**Experimental Design**

During the first semester of participants, an ABAB design, where A = existing response requirements (less response effort for documenting compliant behavior and more response effort for documenting noncompliant behavior) and B = equal response effort requirements (response effort that is equal for documenting compliant and noncompliant behavior) was used to examine the effects of raising the response effort associated with collecting data on hand hygiene compliance. During the second semester of participants, the reverse, a BABA design was employed. The phase changes were implemented every three weeks. Because the participants were taking the practicum class through the university, data collection was suspended in the event the university went on break. Data collection resumed when classes resumed and maintained a three-week data collection period.

**Procedures**

Following presentation and collection of informed consent (Appendix D), the participants collected 10 hours of data per week following the general practicum procedures (see General practicum procedures section). The specific data collected varied based on the research condition in effect.
**Baseline.** During baseline phases, participants adhered to the hand hygiene data collection practices that were in place. Each baseline collection phase lasted for 3 weeks. During the baseline phases, the participants noted pertinent information regarding the observations which consisted of: date, time, unit, employee type, if the opportunity took place before or after the healthcare worker contacted the patient’s environment, if the HCW was compliant or noncompliant, the room number, and if hand hygiene occurred inside or outside of the room. In addition, if the HCW was noncompliant, the participant had to observe and document what the HCW touched. They did not need to observe and document what was touched for compliance.

**Intervention.** During the intervention phases, the participants collected compliance data as they had during baseline, with the additional requirement that they indicate what, if anything, the healthcare worker touched while in the room, for both compliant and noncompliant auditing. During baseline, this step was only required for noncompliant audits. The intervention phases lasted for 3 weeks. The changes in the requirements of data collection were described to the students during weekly meetings at phase changes. At this time, the researcher collected any auditing tools the participants had from the previous stage and distributed the phase-appropriate tools for the next condition.

**General practicum procedures.** The students received undergraduate practicum credit toward their degree in psychology (Appendix E). The participants were required to complete 13 hours of practicum work each week, which consisted of ten hours of data collection, two hours of “free time” for researching journal articles, and a one-hour weekly meeting. The auditors directly observed patient care units at the hospital,
documenting compliance and noncompliance of the employees using an audit tool (Appendix B).

An opportunity to audit occurred when a HCW entered a patient, examination, or procedure room and physically contacted (touches) the patient or the patient’s environment. The patient environment refers to anything within the patient’s room. Objects and equipment inside the patient’s room are audited as the transfer of microorganism to inanimate objects pose an infection risk to both the patient and the HCW. In addition, other opportunities to audit occur when the HCW exits the patient environment, puts on gloves, or removes gloves. A patient encounter was not counted if the HCW walked into a patient’s room and did not come into contact with the patient or environment.

The hospital’s hand hygiene policy clearly specifies when a HCW should use hand hygiene during a patient encounter. At a minimum, hand hygiene should be initiated when the HCW enters the room, before he/she touches the patient or patient’s environment, as he/she leaves the room after touching the patient or patient’s environment, and before and after gloving.
RESULTS

Descriptive Statistics

The results of the first semester’s intervention are graphically displayed in Figure 1. With the exception of the first phase during the first semester, there was a remarkable change with manipulation of the tool during the remaining 3 phase changes. When the baseline tool was used (less response effort to document noncompliant data and more response effort to record noncompliant data), there were higher hand hygiene compliance rates reported. When the intervention tool was used (the response effort was equal for recording compliant and noncompliant data), lower hand hygiene compliance rates were reported.

![Bar chart showing percent compliance across phases in semester one.](chart)

*Figure 1.* Percent compliance across phases in semester one.

Initial implementation of the less response effort tool resulted in 73.63% (n=91) compliance. This was followed by 80.18% (n=111) compliance with the equaled response effort tool, 84.95% (n=93) compliance with reintroduction of the less response tool.
effort tool, and 72.73% (n=99) compliance with reintroduction of the equaled response effort tool.

During the second semester, the order of the tools was reversed as is seen in Figure 2. That is, the equal response effort tool was introduced first. Despite the change in the order of the tools, the results were consistent with increased compliance during the less response effort phase and decreased compliance during the equaled response effort phase. Initial implementation of the equal response effort tool resulted in 61.29% (n=31) compliance, followed by 73.58% (n=53) compliance with the less response effort tool, 66.67% (n=30) with reintroduction of the equal response effort tool, and 85.42% (n=48) with reintroduction of the less response effort tool.

**Inferential Statistics**

Statistical analyses were used to investigate significance of the findings. Because the data are nominal, a non-parametric analysis of variance (Friedman’s Test) was used to
compare observations in order to determine statistical significance. While visual inspection of the data suggest a difference in performance across phases, the results of the Friedman's Test indicate that there was not a statistically significant difference between phases for either group (p=.125).

A second Friedman's statistical test was run to determine if there was a significant effect when the participants audited alone, audited with a peer, or audited with the research assistant (i.e., during an IOA session). The results indicate that there was not a statistically significant difference between the participants auditing alone, with a peer, or with the research assistant when using the less response effort form (p=.368). Similar non-significant results were found when the participants were using the equal response effort tool (p=.779).

A final statistical test was run to determine if there was a difference in the data collected between the two semesters with respect to the less response effort and equal response effort tool. A non-parametric statistical hypothesis test (Wilcoxon Rank Sum Test) was run two times, once for the less response effort tool and once for the equal response effort tool to assess whether or not one of the semesters had a tendency toward larger values. Results show that there was no significant difference between the two semesters for either of the tools (U=3.0, p=.289). That is, with the different students, there was no significant change in the way the participants were auditing.
DISCUSSION

Visual inspection of the data demonstrates that the response effort involved in data collection affects data collecting behavior. With the exception of the behavior change between phase one and two during the first semester, all subsequent phases in the first semester and all phases in the second semester generated a visually salient change in hand hygiene compliance. When response effort increased, compliant audits decreased. When response effort decreased, compliant audits increased. That is, based on visual inspection, when the response effort for both conditions was equalized, and there was no longer an “easier” compliance option, the participants chose this option less often.

Despite visual changes in the data, statistics failed to demonstrate a generalizable effect between increasing the response effort associated with collecting hand hygiene behavior and hand hygiene compliance data. Notwithstanding, the lack of statistical significance may have been due to the low sample size. Because the data were nominal, the sample size referred to the number of participants, not the number of observations as was anticipated. Taking this into consideration, the disconnect between visual inspection and statistical significance may be due to the extremely low sample size (N=4, N=3).

In addition, although statistical significance was not evident, the clinical significance of the findings cannot be overlooked. Every hand hygiene event that is noncompliant potentially signifies an opportunity to improve performance. By effectively improving safety performance, HCWs and the patients they treat have a decreased risk of HAI transmission.

Implications of these findings may warrant an increased awareness of data collection procedures where recording options include a less effortful response. As noted earlier, basic experimental research has demonstrated that when presented with two
choices, one being less effortful, an organism will choose the response with the least amount of effort (Baum, 1974; Billington & DiTommaso, 2003). The visual results of this study seem to support these research findings in an applied setting, bringing into question the integrity of data collection procedures and the integrity of the data collected. To the author’s knowledge, and although it affects a multitude of data collection procedures, no applied research has been conducted.

Also mentioned earlier was the author’s concern for standardizing reporting systems to ensure solidarity of hand hygiene reporting procedures. Ensuring that the data collection and reporting of hand hygiene compliance between institutions is the same for comparison purposes is not only important for benchmark data used by organizations, but also for comparisons within research. Further, specification of the auditing tools used in data collection to ensure that there are no unseen barriers to correctly reporting compliance is essential.

Future research would benefit by further breaking down the auditor-data relationship. An increased sample size may lend support to examining the behavioral difference between auditors. Specifically, a larger sample size would allow the individual behavior of each auditor exposed to the manipulated independent variables to be compared with his/her peers. Unfortunately, the observation sample size of each auditor was too small for comparison after the data was broken down into phases.

In addition to examining individual behavior, conducting similar research in a controlled lab setting may result in bolstered effects. A non-variable environment, in addition to the absence of reactivity, would give a more precise account of human data
collecting behavior. Because it was a hospital setting, the environment was constantly changing. Controlling for this might support effects.
REFERENCES


hygiene in 4 intensive care units. *Journal of General Internal Medicine, 21* (Suppl. 2), S35. doi:10.1111/j.1525-1497.2006.00361.x


37


compliance in a step-down unit. *Infection Control and Hospital Epidemiology: The Official Journal of the Society of Hospital Epidemiologists of America*, 29, 730-735. doi:10.1086/590122


doi:10.1177/14690446040050030401


doi:10.1093/infdis/67.3.275


doi:10.1097/00006534-195011000-00022


Voss, A., & Widmer, A. F. (1997). No time for handwashing!? Handwashing versus alcoholic rub: can we afford 100% compliance? *Infection Control and Hospital Epidemiology: The Official Journal of the Society of Hospital Epidemiologists of America*, 18, 205-208. doi:10.1086/647590


Appendix A

Hand Hygiene Graphical Feedback
December, Fourth-Quarter, and Year-To-Date Hand Hygiene Data

Please Post

### December 2011 Hand Hygiene Data By Unit

<table>
<thead>
<tr>
<th>Unit</th>
<th>Compliance</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMU</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>APUR</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>CAR</td>
<td>92%</td>
<td></td>
</tr>
<tr>
<td>CSU</td>
<td>78%</td>
<td></td>
</tr>
<tr>
<td>ED</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>ENDO</td>
<td>92%</td>
<td></td>
</tr>
<tr>
<td>GMU</td>
<td>69%</td>
<td></td>
</tr>
<tr>
<td>GSU</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>LAB</td>
<td>93%</td>
<td></td>
</tr>
<tr>
<td>LAB OP</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>MBU</td>
<td>81%</td>
<td></td>
</tr>
<tr>
<td>MICU</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>MCVU</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>MVU</td>
<td>53%</td>
<td></td>
</tr>
<tr>
<td>PACU</td>
<td>68%</td>
<td></td>
</tr>
<tr>
<td>PEDS</td>
<td>89%</td>
<td></td>
</tr>
<tr>
<td>PICU</td>
<td>76%</td>
<td></td>
</tr>
<tr>
<td>PRU</td>
<td>38%</td>
<td></td>
</tr>
<tr>
<td>RAD IP</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>RAD OP</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>TCU</td>
<td>77%</td>
<td></td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>83%</td>
<td></td>
</tr>
</tbody>
</table>

### December 2011 Hand Hygiene Data By Employee Type

<table>
<thead>
<tr>
<th>Employee Type</th>
<th>Compliance</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVT</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>EVS</td>
<td>71%</td>
<td></td>
</tr>
<tr>
<td>KCMS</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>LAB</td>
<td>86%</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>PATIENT TRANSPORT</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>PCA</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>RAD</td>
<td>79%</td>
<td></td>
</tr>
<tr>
<td>REHAB</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>RN</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>RRT</td>
<td>79%</td>
<td></td>
</tr>
<tr>
<td>STUDENT NURSE</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>UNIT CLERK</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>77%</td>
<td></td>
</tr>
</tbody>
</table>

(Compliance - Sample Size)
Appendix B

Hand Hygiene Auditing Tools
**HAND HYGIENE AUDIT TOOL**

**AUDDOR NAME:**

**DATE:**

**START TIME**

- **AM**
- **PM**

**IOA WITH**

- **IOA**
- **IOA**

**DATA ENTERED**

- **IOA**
- **IOA**

**A/A + D =**

**%**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>CATEGORY</th>
<th>OBSERVATION (CHECK ONE)</th>
<th>COMPLIANCE (CHECK ONE)</th>
<th>ROOM #</th>
<th>WHERE WASHED</th>
<th>IF NON-COMPLIANT, WHAT WAS TOUCHED</th>
<th>EMPLOYEE NAME OR COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**END TIME**

- **AM**
- **PM**

PLEASE RETURN TO BOX 86 AT END OF DAY

© BRONSON
### HAND HYGIENE AUDIT TOOL

**AUDITOR NAME**

**DATE**

**START TIME**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Employee Type</th>
<th>Before</th>
<th>After</th>
<th>Yes</th>
<th>No</th>
<th>Room #</th>
<th>Washed In</th>
<th>Washed Out</th>
<th>Washed N/A</th>
<th>Touched?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Job Aid (second side of auditing tool)
<table>
<thead>
<tr>
<th>UNIT ABBREVIATIONS</th>
<th>CATEGORY ABBREVIATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMU Adult Medical Unit</td>
<td>AMB Ambulance</td>
</tr>
<tr>
<td>Rooms 3820-3880</td>
<td>CVT Cardiovascular Tech</td>
</tr>
<tr>
<td>APU Antepartum Unit</td>
<td>EVS Environmental Services Housekeeping</td>
</tr>
<tr>
<td>Rooms 5842-5856</td>
<td>Maroon Scrubs</td>
</tr>
<tr>
<td>CAR Cardiology</td>
<td>FS Food Service</td>
</tr>
<tr>
<td>Rooms 491-449</td>
<td>Blue Vest</td>
</tr>
<tr>
<td>CSU Cardiac Surgery Unit</td>
<td>KCMS KSU/KCMS Resident or MD</td>
</tr>
<tr>
<td>Rooms 253-258</td>
<td>White labcoat with green KCMS logo</td>
</tr>
<tr>
<td>ED Emergency Department</td>
<td>LAB Lab Tech</td>
</tr>
<tr>
<td>Includes CDU &amp; Triage</td>
<td>Light or Dark Blue Scrubs</td>
</tr>
<tr>
<td>ENDO Endoscopy</td>
<td>MT Maintenance</td>
</tr>
<tr>
<td>GMU General Medical Unit</td>
<td>MD Physician</td>
</tr>
<tr>
<td>Rooms 460-478</td>
<td>Dress clothes and/or labcoat</td>
</tr>
<tr>
<td>GSU General Surgery Unit</td>
<td>OR Operating Room Staff</td>
</tr>
<tr>
<td>Rooms 201-249</td>
<td>Light blue scrubs, shoe booties, head covers, masks around necks</td>
</tr>
<tr>
<td>IP RAD Inpatient Radiology</td>
<td>PC Pastoral Care</td>
</tr>
<tr>
<td>(Tiled)</td>
<td>PCA Patient Care Assistant</td>
</tr>
<tr>
<td>L&amp;D Labor &amp; Delivery</td>
<td>Teal Scrubs</td>
</tr>
<tr>
<td>MBU Mother Baby Unit</td>
<td>PH Pharmacy</td>
</tr>
<tr>
<td>Rooms 5802-5840</td>
<td>PT Patient Transport</td>
</tr>
<tr>
<td>NICU Neonatal Intensive Care Unit</td>
<td>Gray Scrubs</td>
</tr>
<tr>
<td>Rooms 430-443</td>
<td>Dark Blue Scrubs</td>
</tr>
<tr>
<td>(Including SDU Rooms)</td>
<td>RN Nurse</td>
</tr>
<tr>
<td>NVU Neurovascular Unit</td>
<td>White Top/Green Bottom Scrubs,</td>
</tr>
<tr>
<td>Rooms 350-393</td>
<td>Juvenile patients (juvenile units) light blue scrubs (surgical units)</td>
</tr>
<tr>
<td>OPL Outpatient Lab</td>
<td>RRT Respiratory</td>
</tr>
<tr>
<td>OSU Ortho/Surgical Unit</td>
<td>Dark Blue Scrubs</td>
</tr>
<tr>
<td>Rooms 301-325</td>
<td>Dark Blue Scrubs</td>
</tr>
<tr>
<td>OP RAD Outpatient Radiology</td>
<td>Rehab Rehabilitation, Can be PT, OT</td>
</tr>
<tr>
<td>(Carpeted)</td>
<td>Dark Blue Scrubs</td>
</tr>
<tr>
<td>PACU Post Anesthesia Care Unit</td>
<td>PN Nurse</td>
</tr>
<tr>
<td>PEDS Pediatrics</td>
<td>White Top/Green Bottom Scrubs,</td>
</tr>
<tr>
<td>Rooms 301-349</td>
<td>Juvenile patients (juvenile units), light blue scrubs (surgical units)</td>
</tr>
<tr>
<td>PICU Pediatric Intensive Care Unit</td>
<td>RRT Respiratory</td>
</tr>
<tr>
<td>Rooms 336-343</td>
<td>Dark Blue Scrubs</td>
</tr>
<tr>
<td>PRU Post Procedure Unit Prep &amp; Recovery Unit</td>
<td>UC Unit Clerk</td>
</tr>
<tr>
<td>Rooms 394-399</td>
<td>VISITOR Visitor</td>
</tr>
<tr>
<td>TCU Trauma Care Surgery</td>
<td>VOL Volunteer</td>
</tr>
</tbody>
</table>
Appendix D

HSIRB Approval Letter
Date: May 7, 2010

To: Heather McGee, Principal Investigator
Krista Hinz, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number: 10-04-19

This letter will serve as confirmation that your research project titled "The Effects of Altering Response Effort during Data Collection on Observer Accuracy: Data Collection Procedures on Hand Hygiene Compliance" has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

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

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

Approval Termination: May 7, 2011
Appendix E

Syllabus/Student Signature Form
PSY 397 – I/O Practicum Syllabus

Spring 2010 Semester

Supervisor Information

Supervising Faculty: Alyce Dickinson, PhD

Hospital X Supervisor: Krista Hinz, BS

E-mail: hinzk@hospitalx.org

Cell Phone: 269-906-0244

General Description

This practicum will consist of getting hands-on experience in a large business setting. You will be conducting behavioral observations, giving feedback to staff, entering data, graphing data, and will also apply the information you have learned to present a possible intervention to a safety committee. This will give you a great opportunity to see how a large organization runs.

Prerequisites

PSY 3300 and 3600 are required, and 4440 and 4600 are recommended. This practicum is for psychology majors only.

Requirements

You will be required to attend orientation at Hospital X, complete online training, have a background check run by Hospital X, get a drug screen, and make sure all vaccinations are up-to-date (which may include getting a TB test). These items are required by Hospital X.

You will be required to perform 13 hours of weekly work at Hospital X, which will include 10 hours of auditing, 2 hours for researching your proposal, and a 1-hour weekly meeting.

You must have your own transportation available to get to Hospital X.
Objectives

- Establish a rapport with Hospital X employees
- Perform behavioral observations
- Enter Data
- Graph Data
- Give feedback on behavior
- Compile data
- Present your ideas to a committee

Dress Code

All students must follow Hospital X’s Personal Appearance Code listed below:

- All employees/volunteers will wear hosiery or socks and street shoes that provide for a safe movement.
- Hair must be neat, clean and restrained or secured for health purposes. Extreme hairstyle or unnatural hair color is not appropriate within the professional work setting.
- Nails must be cleaned and well groomed.
- Identification badges must be worn at all times that you are on Hospital X’s campus and must be worn on the upper torso clothing. No pins, stickers, or alterations to the badges are allowed.
- Make-up and perfume/cologne can be worn in moderation.
- Jewelry, pins, and buttons must be worn in good taste. No jewelry will be worn that poses a safety or health risk to employees or patients. No nose rings/studs or other body piercing such as eyebrow, lip, or tongues, etc. (other than ears) will be allowed. (It is not acceptable to cover these items up with a band-aid either.)
- Tattoos must be concealed at all times.
- No hats or caps are allowed to be worn inside Hospital X.
- All clothing will be clean, wrinkle free, in good repair, and appropriately fitting.
- No denim jeans/clothing is allowed.
- In addition, there will be light blue scrubs that must be worn every time you are here at Hospital X completing hours for this practicum.

Grades

You will be graded on the following items:

- Data Collection
  - Interobserver agreement
    - You will engage in collecting interobserver (IOA) measurements for 30% of your audits. Collection of less than 25% IOA will result in a deduction of 8 points from your weekly points.
• Attendance
  o You will lose points for missing a scheduled observation without prior approval from the Hospital X supervisor. All missed time must be rescheduled within one week. This is a critical part of your grade since you will be responsible for completing a set number of observations per week. Observation time will consist of being on task at all times and doing any other activities (such as giving feedback) that has been scheduled.
    • If you do not show up and do not call to inform the supervisor, your final grade will be lowered by one half of a letter grade.
  o You will be given 3 allowances for re-scheduling (illness, etc.), if you exceed these allowances, 3 points will be deducted for each occurrence.
  o When a meeting is missed, it is your responsibility to obtain any assignments or information that was discussed at the meeting. You will not be able to make up the 10 points lost from missing the meeting.
  o You are expected to be on time to all scheduled observations and meetings. A deduction of 5 points will occur if you are tardy for observations (without calling for approval), and 5 points will be deducted if you are not on time for meetings. You will use available Hospital X computers to clock in and out.
  o Timesheets are to be e-mailed to me by noon sharp on Mondays. I advise e-mailing them early, as 5 points will be deducted if they are turned in at or after 12:01 p.m. on Mondays.
• Journal Articles
  o For your final paper, you will be asked to include peer-reviewed journal articles. Throughout the semester, you will be asked to research articles pertaining to an intervention you would like to suggest to improve hand hygiene compliance.
  o You will turn in a printed copy (full article, no abstracts), highlighting or marking crucial aspects. You will give a brief summary of the article during our meeting. The article and summary will be worth 7 of your weekly 15 points.
• Final paper presentation to committee – you will be graded on the degree of accuracy in your paper and professionalism that you display during the presentation, as well as giving correct information in your presentation. More details will be given later.
• The points will be given as follows:
  o 12 hours of active on-site data collection, data entry, article research, etc. per week: 15 points/week
  o 1 hour attendance of weekly meeting: 10 points/week
  o Final presentation to committee and paper: 100 points
• Grade Allocations:
  o 95-100% = A
  o 90-94% = BA
  o 85-89% = B
  o 75-84% = C
  o < 74% = E
Confidentiality
Since you will be working in a hospital setting, the confidentiality of the patients, employees, and organization are crucial. Do not discuss any sensitive information (such as the results of the data collection, what behavior you are measuring, etc.) that may harm a patient, employee, or the organization, etc. Things that are discussed in the weekly meetings with the graduate supervisor/Hospital X supervisor are also confidential and should not be discussed elsewhere. If you have a problem with someone at Hospital X, please discuss this with the Hospital X supervisor. Never say anything negative about Hospital X or anyone who is employed by Hospital X outside of our meetings. You never know who is around when you are talking. Furthermore, no data should leave Hospital X’s campus.

Ethics
As a student of this practicum, you are representing the psychology program at Western Michigan University. It is your moral and ethical obligation to document and report all findings. Failure to document and report the behaviors of interest will not be tolerated. Falsifying, withholding, or fabrication of data will result in an immediate dismissal, and failure in the class. Hospital X reports the data nationally; it is also used for accreditation purposes. It is crucial that as a student at WMU, and also as a volunteer at Hospital X, that all findings are reported. We are given the opportunity to improve compliance of a very significant safety behavior. Patients are directly affected by compliance and/or noncompliance of this behavior. Therefore, falsifying, withholding, or fabrication of this data prevents correction of this behavior when and where it is needed.

Policies for Dismissal
A student will be removed from the practicum and given an E for any of the following reasons:

- Chronic absences
- Falsifying data
- Removing data from Hospital X campus (either a hard copy or electronically)
- A breach in confidentiality
- Not finishing training, vaccinations, or orientation
- Not passing a background check or drug screen
- Not following Hospital X’s Personal Appearance Code. It is the right of Hospital X employees to ask you to immediately leave the premises for not meeting Hospital X’s standards.
- Any behavior that is in violation with the Western’s Student Code of Conduct

61
PSY 397: Practicum at Hospital X
By signing and dating below, you are indicating that you have read, understood, and agreed to everything mentioned in the above.

Printed Name: 

Signature: 

Date: 