Research Contribution

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EFFECTS OF OBSERVING EMPLOYEES FOR FOOD SAFETY COMPLIANCE

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ABSTRACT

Research investigating foodservice employees' compliance with food safety guidelines often utilizes observational methodology where an observer is present and recording employees' behaviors as they work. Research must determine if the observer's presence influences employees who are trained in food safety and those who are not. A group who had received a four-hour ServSafe® food safety training course and a control group were included in the study (N=252). Both groups' compliance rates were higher during the first hour of the observation compared to the last two hours of the observation. Implications for foodservice managers, researchers, and health inspectors are discussed.

Keywords: food safety, restaurant employees, ServSafe® training, observation methodology, social desirability, habituation

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INTRODUCTION

Inadequate levels of compliance with proper food safety practices in foodservice operations remain a challenge of operators and researchers alike. Research studies employing the most ambitious methodologies have involved observing foodservice employees' behaviors during food production. However, there is potential for an observer's presence to influence employees' behaviors, which may compromise the validity of the data. This study investigated whether employees adjust their compliance with food safety guidelines when aware they are being observed for those behaviors, identified if there is a point in time when employees become habituated to an observer's presence, and assessed whether food safety training influences the adjustment of compliance rates while being observed. This was accomplished by analyzing trends for compliance over the course of a three-hour observation session for a group of employees who had received ServSafe® food safety training and a group of employees who had not.

LITERATURE REVIEW

Foodborne illnesses are the cause of 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths annually in the United States (Centers for Disease Control and Prevention, 2011). Accordingly, assuring the safety of foods consumed is a public health priority (Castellanos, Myers, & Shanklin, 2004; Food and Drug Administration [FDA], 2004, 2009; United States Department of Health and Human Services, n.d.). The current research focuses on food safety in restaurants due to the significant number of meals consumed in restaurants as well as the high percentage of foodborne illness outbreaks attributed to restaurants. In 2011, foodservice industry sales will top $600 billion for the first time in history, reaching an unprecedented $604.2 billion. Of this, $550.8 billion will come from commercial operations. Additionally, 43% of Americans indicated that restaurants are an essential component of their daily lifestyle (National Restaurant Association, 2010).

Further contributing to the importance of restaurant food safety research is the fact that a majority of reported foodborne illness outbreaks (59%) are traced to food consumed in restaurants (Centers for Disease Control and Prevention, 2006). Restaurants are often out-of-compliance with guidelines more than nursing homes, elementary schools, and hospitals (FDA, 2004, 2009).

Research in restaurants also is important because it provides information about the compliance rates with food safety guidelines, and can help determine whether providing food safety training influences compliance levels among employees. Such research can allow researchers to look at trends that may result from training or regulatory changes, and provide perspective for researchers desiring to develop and initiate interventions to improve compliance levels. The accuracy of the data collected and reported is essential because it forms the basis of important decisions and policies designed to improve food safety compliance rates. As such, research must investigate the accuracy of data collected through various methodologies.

Research Relying on Employees' Self-Reports

Researchers have investigated food safety compliance rates in restaurants using employees' self-reports (Clayton, Griffith, Price, & Peters, 2002; McElroy & Cutter, 2004). However, there is no way to determine the reliability or validity of self-reported data. Self-reported data, especially for socially sensitive topics, can be biased toward a socially desirable response (Crowne & Marlowe, 1960; Eagly & Chaiken, 1993). To be perceived positively, individuals are likely to provide responses consistent with perceived norms (Leary, 1996). Researchers have reported the effects of social desirability bias on self-reports of attitudes (Fisher, 1993), values (Fisher & Katz, 2000), personality characteristics (Mick, 1996), and behaviors (Mensch & Kandel, 1988). Therefore, foodservice employees may be likely to self-report complying with guidelines more often than they actually perform the behaviors.

Research Relying on Health Inspectors' Reports

Research has relied on health department inspection scores as evidence of restaurant employees' compliance with food safety guidelines (Casey & Cook, 1979; Cotterchio, Gunn, Coffill, Tormey, & Barry, 1998; Kneller & Bierma, 1990; Kwon, Roberts, Shanklin, Liu, &

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Yen, 2010; Mathias et al., 1994; Mathias, Sizio, Hazelwood, & Cocksedge, 1995; Roberts, Kwon, Shanklin, Liu, & Yen, 2011; Wright & Feun, 1986). Use of such secondary data has limitations in terms of reliability and validity. Researchers are unable to determine whether health inspectors have conducted thorough, quality inspections. Bryan (1990) indicated that inspections are based on the individual judgment of inspectors, and inspectors often rate an operation differently than their peers. Further, Kassa, Harrington, Bisesi, and Khuder (2001) noted that inspectors' reports are not consistent with microbiological tests of food surfaces in restaurants. Other studies found that scores on restaurant health inspectors' reports are not predictive of foodborne illness outbreaks (Cruz, Katz, & Suarez, 2001; Jones, Pavlin, LaFleur, Ingram, & Schaffner, 2004; Penman, Webb, Woernle, & Currier, 1996).

Research Utilizing Observational Methodology

Many of the most ambitious studies have utilized behavioral observation to assess foodservice employees' compliance with food safety guidelines in restaurants (Clayton & Griffith, 2004; FDA, 2000, 2004, 2009; Green et al., 2006; Howes, McEwen, Griffith, & Harris, 1996; Manning & Snider, 1993; Paez, Strohbehn, & Sneed, 2007; Pilling et al., 2008; Pilling et al., 2009; Roberts et al., 2008; Strohbehn, Sneed, Paez, & Meyer, 2008). These researchers observed employees' compliance with food safety practices during food production activities. Roberts et al. (2008) observed foodservice employees who participated in a four-hour ServSafe® food safety training session and a control group to evaluate the effects of training on employees' compliance with selected food safety guidelines (using thermometers, handwashing, and surface control). The researchers recorded when employees performed individual behaviors properly or improperly, and then calculated compliance rates. A significant increase in overall food safety behaviors from pre- to post-training was found. When exploring individual practices, only handwashing behavioral compliance increased significantly. Manning and Snider (1993) observed temporary foodservice operations at a fair for compliance with food safety guidelines. They used an observational checklist that included practices related to hygiene, storage and hot/cold holding equipment, food surfaces, and handwashing. The researchers found no relationship between the behavior of employees and their knowledge and attitudes relating to personal hygiene and cross contamination. Specific behaviors that needed improvement included handwashing and bare-hand contact with ready-to-eat foods.

Although many restaurant food safety studies utilized observational methodology, the researchers did not find any studies that investigated the effects of this methodology (i.e., effects of the observer's presence) on compliance rates during the observation period. When interpreting results of observational studies, there are some important issues to consider: How does the presence of the observer and the employees' knowledge that their food safety practices are being observed influence their compliance with food safety guidelines? Is the behavior observed an accurate depiction of how employees would behave if they were not being observed, or is it an adjusted, more socially desirable response? In essence, do such behavioral observations have construct validity? The current study seeks to investigate these questions.

Theoretical Support for the Research Focus

There is research to suggest that observation influences the observed individuals' behaviors. According to the social desirability theory, individuals present themselves in socially desirable ways, especially related to socially sensitive topics (Crowne & Marlowe, 1960; Helmes & Holden, 2003). When individuals know they are being observed, they will behave in ways they believe are socially desirable or acceptable. Given that noncompliance with food safety guidelines can contribute to severe consequences (e.g., serious illness, death), social desirability theory would suggest that employees will attempt to increase their compliance with guidelines when they are aware of being observed for those practices.

Other research has shown that employees increase productivity when they are aware that they are the focus of a research study. This is referred to as the Hawthorne effect and was first discussed by Mayo (1933). In this situation, again, the person is giving a socially desirable response.

Research on social facilitation (Zajonc, 1965; see also Aiello & Douthitt, 2001) suggests that having an audience improves an individual's performance on well-learned tasks. However, observation can actually decrease one's performance on tasks that are not well-learned (due to anxiety of being watched).

Although the process of being observed influences individuals' behaviors, research indicates that those who are being observed become habituated at a point in time, and being observed after this no longer influences their behaviors. Hagen, Craighead, and Paul (1975) observed habituation when watching interactions between mental health technicians and their patients. Zebiob, Forehand, and Resick (1979) observed habituation when watching mothers interacting with their young children.

Purposes of the Current Study

The goal of this study was to address a gap in the literature by investigating the effects of observation on restaurant food production employees' compliance rates with three selected food safety practices, when the employees are aware of the observation and its purpose. The researchers sought to identify whether the employees exhibit a habituation effect during the course of the observation and the point at which employees become habituated to the researcher's presence. This is important knowledge for researchers because employees' compliance rates after this time will be a more accurate indication of their typical behaviors.

The second purpose of the study was to investigate whether employees who are trained in food safety and those who are not trained are influenced by the observation in a similar fashion. While the Hawthorne effect suggests that participants increase productivity when they know they are being observed, the phenomenon of social facilitation suggests that untrained employees may not have higher compliance rates when being observed because performance does not improve during tasks that are not well-learned. Identifying the effects of observation on food safety trained and untrained employees would determine whether researchers need to approach observations of these groups in different fashions (due to different abilities for adjusting compliance levels). An initial social facilitation effect was predicted: the trained group was expected to exhibit higher compliance rates in the presence of an observer at the beginning of the observation. However, the untrained control group was not expected to exhibit higher compliance rates at the beginning of the session due to lack of knowledge and the anxiety of being watched during tasks that had not been learned. Although the control group may know many aspects of food safety, they probably are aware they have not received formal training and are uncertain of more sophisticated aspects of food safety.

Thus, the research questions for this study included: 1) Do employees exhibit a habituation effect during the course of an observation and at what point do employees become habituated to the researcher's presence?; and 2) Are employees who are trained in food safety

influenced by the observation in a similar fashion as those who have no training?

Food Safety Behaviors Targeted

This study involved observing foodservice production employees for specific behaviors related to handwashing, use of thermometers, and handling of work surfaces. These behaviors were targeted because the improper performance of these behaviors is known to contribute most significantly to foodborne illnesses (FDA, 2004). Behaviors were limited because it was not feasible to observe compliance with all food safety guidelines.

METHODS

Development and Validation of the Observation Instrument

An observation form (Figure 1) was developed to assist in manually recording foodservice employees' compliance with food safety guidelines. Although the three behaviors of interest were handwashing, use of thermometers, and handling of work surfaces, it was necessary to identify more specific behaviors to record for each behavioral category. A panel of food safety experts made a list of specific behaviors for each behavioral category (e.g., handwashing), and included behaviors related to performing the behavior at appropriate times (e.g., after sneezing, using the bathroom) and with the proper technique (e.g., using soap and hot water). On the observation form, each specific behavior was listed on the left side grouped under the broader behavioral category. On the right side of the form were two columns where observers could indicate when the employee performed the specific behavior at the correct time (or with proper technique), or when they performed it incorrectly. The researchers modeled the observation form after previous research that had utilized observational methodology (Johnson, 1995; Toro, 2005).

The observation form was pilot tested with all researchers (ServSafe® certified graduate research assistants) who would be collecting data. During testing, pairs of researchers observed up to four foodservice employees in restaurants that were not included in the final data collection. Researchers observed employees for 20 minutes, and then took a 10-minute break to compare their coding, discuss discrepancies in their coding, and reach agreement for the appropriate codes to use. This procedure was repeated five times; the observation session lasted three hours. Modifications were made to the observation form as necessary. The pilot testing served to train all observers and allowed them to become familiar with the observation form. The average inter-rater reliability estimate for two researchers observing the same employees over a three-hour session was established at .71 for their initial coding, although discussion improved reliability to 100% agreement.

ServSafe® certification of observers and extensive pilot testing with the observation form contributed to maximizing the objectivity of all behaviors observed. Pilot testing allowed all observers to agree about how best to code behaviors that may be more vague or subjective than others. Pilot testing was completed by all possible pair combinations of observers, so each person was allowed the opportunity to discuss discrepancies with all other observers. Following pilot testing, all observers met as a group to further discuss the coding protocol for the more subjective behaviors. In this way, the researchers removed as much subjectivity as possible from the coding.

Recruitment

The population of interest was restaurant food production staff. Due to budget limitations, only restaurants within a 300-mile radius of the research university were considered. Lists of foodservice establishments and their contact information were obtained from the

Figure 1. Food Safety Observation Form

Food Safety Restaurant Observation Form

Restaurant code: _____ **Date**: _____

Time period: _____ **Number of employees observed**: _____

Employee code A:_____ **B**:_____ **C**:_____ **D**:_____

Observation Activity	Observed Yes	Observed No	Note
I. Hand Washing			
Employees wash their hands after the following activities:			
1. When shift begins			
2. Returning to the work area (after smoking, eating, chewing gum or tobacco, bussing dirty dishes, or using the restroom)			
3. Before putting on clean gloves			
4. Handling raw food (before and after)			
Handling chemicals that might contaminate food			
5. Touching body parts (hair, face, or body) ***(Note: Cap at 5 observations and ending time)***			Ending Time:
6. Touching clothing or aprons ***(Note: Cap at 5 observations and ending time)***			Ending Time:
8. Touching anything else that may contaminate hands, such as unsanitized equipment, work surfaces, cleaning cloths, and drinking straw.			
9. When food preparation tasks are interrupted or changed			
10. Sneezing, coughing, or using a handkerchief or tissue			
Hand Washing Procedure			
14. Vigorously scrub hands for at least 20 seconds			
15. Vigorously scrub arms above wrists for at least 20 seconds			
16. Clean between fingers			
17. Clean under fingernails			
18. Rinse thoroughly under running water			
19. Dry hands and arms with a single-use paper towel or warm-air hand dryer			
II. Using Thermometers			
1. Wash, rinse, sanitize, and air-dry before and after use			
2. Check internal temperature of food by inserting the thermometer stem or probe into the thickest part of the product			
3. Check temperature of food at the completion of cooking			
4. Check temperature of food at the completion of reheating			
5. Food stored on the hot line is at least 135°F			
6. Food stored on the cold line is 41° F or less			
III. Food Handling and Cleaning and Sanitizing Work Surfaces			
1. Food is covered when transported			
2. Food is covered and labeled properly before holding or storing			
3. Food contact surfaces are free of dust, dirt, and food particles			
4. *Leftovers labeled & dated (check anything over 7 days old)			
5. Separate raw products from cooked and ready-to-eat products			
6. Wiping cloths are stored in a sanitizing solution			
7. Separate wiping cloths are used for food and nonfood surfaces			
All food-contact surfaces (hands/gloves, countertops, cutting surfaces, equipment, dishes & utensils) must be washed, rinsed, and sanitized following:			
8. Anytime begin working with another type of food or ingredients			
9. After touching anything that might contaminate the food-contact surfaces			

Note:

Missouri telephone directory and from foodservice licensing agencies in Kansas and Iowa. All restaurants, including casual, fine dining, and quick-service, regardless of ownership structure (corporate or independent) were included in the sample. A systematic random sample was obtained by calling every fifth restaurant.

Recruitment was conducted between May 2005 and July 2006. Student assistants made unsolicited "cold calls" to restaurant managers, during which they followed a script that described the study requirements and timeline, and offered the managers free food safety training for all food production staff in exchange for participation. If the manager wished to learn more about the study, a packet of informational materials was mailed to them, and if necessary, a principal investigator travelled to the establishment to speak directly with the manager. Thirty-one of 1,298 restaurant managers who were contacted agreed to participate in the study. Because the manager made the decision to participate or not, there is no reason to believe that employees who participated are different from employees whose managers declined participation. While managers originally consented for their employees to participate in

the research study, consent also was obtained from each employee who participated.

Procedure

This study utilized an observational methodology in a cross-sectional design, with participating employees assigned to one of two groups. One group received ServSafe® food safety training prior to being observed for food safety compliance during food production; the observation occurred one to two weeks after training was complete. The other group served as a control and was observed prior to receiving the training. This manipulation allowed the researchers to test whether employees who are trained in food safety and those who are not will be influenced similarly by the observer's presence. It is important to note that all employees received training by the end of the study, and all were observed for their compliance with behaviors related to the three specific food safety practices. Both groups were aware they were being observed for food safety behaviors; however, they were not aware that the observation was specifically for handwashing, thermometer usage, and handling of work surfaces.

Training. ServSafe® training was chosen because ServSafe® is the national standard in the restaurant industry. Four-hour training sessions were offered because this length is generally targeted at employees, while longer (i.e., eight or 16-hour) sessions are typically targeted at managers. Using the ServSafe® Employee Training Guide and supporting materials, the ServSafe®-certified instructors covered topics such as defining foodborne illnesses, using proper personal hygiene, preventing cross-contamination, avoiding time and temperature abuse, and cleaning and sanitizing. The behaviors targeted for observation in the study were not emphasized more than usual in the training. The training was free of charge for all food production employees at participating restaurants, and employees were compensated for their training time at their hourly rate. The training sessions were offered in locations convenient to restaurant staff (e.g., in the restaurant itself, or at local meeting sites). Multiple training sessions and English-to-Spanish translators were available to maximize employee participation.

Observations. As in the pilot testing, the food safety observations were conducted over three-hour sessions in restaurant kitchens during a lunch or dinner shift. One researcher was able to observe a maximum of four employees simultaneously. If more than four employees were available for observations, an appropriate number of researchers were present to conduct the observations. The three-hour observation sessions were separated into six 20-minute periods with 10-minute rest periods between. The rest periods served to reduce observer fatigue, thus enhance the accuracy of researchers' recordings of employees' behaviors. A separate observation form was used for each 20-minute session, which allowed the researchers to compare the influence of the observer's presence on the employees' behaviors through the course of the observation.

Employees were observed for their compliance with food safety guidelines related to handwashing, thermometer usage, and handling of work surfaces. Food safety behaviors were considered to be performed correctly if they were completed at the correct time or using the correct technique. Food safety behaviors were considered to be performed incorrectly if they were not completed at the time they should be or if they were not completed using the appropriate technique. If a behavior was observed to be performed correctly, a tick mark was placed in the appropriate column, and if a behavior was performed incorrectly a tick mark was made in a different column.

Statistical Analysis

On each of the six observation forms, the tick marks for behaviors within each of the three behavioral categories were added together, separately, in the two columns (i.e., indicating the number of times each behavior was performed correctly and the number of times each behavior was performed incorrectly). Additionally, column totals were calculated, which combined the data for all three behavioral categories into one composite score.

Next, compliance rates were calculated as percentages of food safety behaviors performed correctly by taking the number of times the behavior was performed correctly during that period, divided by the total number of times the behavior should have been performed correctly (i.e., the sum of the "correct" and the "incorrect" columns), multiplied by 100. This was done separately for all three behavioral categories and for a behavioral composite, for each of the six periods during the three-hour observation. Therefore, there were a total of 24 compliance percentages calculated for each participant: six for each of the three behavioral categories and six for the overall behavioral composite, with the six percentages representing compliance during each of the six 20-minute periods within the three -hour observation session.

A series of four mixed factors Analyses of Variance (ANOVAs) were performed on the data. One ANOVA was performed for each of the three behavioral categories, and one for the behavioral composite. In each analysis, the between-subjects factor was employee group, with two levels: trained group and control group; the within-subjects factor was behavioral compliance rates, with six levels: employees' compliance rates during the six 20-minute periods composing the three-hour observation session (Sessions 1 to 6). This factor let the researchers determine whether the employees' compliance rates varied over the six sessions (i.e., to evaluate potential habituation effects to the observer's presence). Helmert contrasts were employed to determine whether employees' compliance rates in the first or second sessions were different from the remaining sessions, which would be expected if habituation effects exist. The interaction effect allowed the researchers to test whether the observer's presence influences trained and untrained employees similarly.

RESULTS

Sample Characteristics

Two-hundred fifty-two employees from 31 restaurants participated. Participants were predominantly male (69.6%). The average age was 28.3 years (*SD* = 10.4), and the average length of industry experience was 7.8 years (*SD* = 8.1). Establishments included quick- and full-service, chain and independently owned, and American and ethnic cuisine restaurants. Participants were either assigned to the control group (n = 158) or the trained group (n = 94). Some managers originally in the trained group discontinued participation after their employees received the free training, so behavioral observations could not be completed, which led to unequal group sizes.

Effects of Observation

The test of the differences between the compliance rates for the six 20-minute observation sessions was significant for employees' overall behavioral compliance [F (5, 770) = 5.72, p < .001], handwashing [F (5, 670) = 5.57, p < .001], and handling of work surfaces [F (5, 145) = 2.87, p < .05]. Refer to Table 1 for mean compliance percentages and standard errors for the analyses. Helmert contrasts revealed that employees' compliance rates during the first 20-minute session were significantly higher than in later sessions (Sessions 2 through 6) for overall compliance [F (1, 154) = 19.26, p < .001)], handwashing [F (1, 134) = 11.23, p < .001)], and handling of work surfaces [F (1, 29) = 17.14, p < .001)]. Employees' compliance rates in Session 2 continued to be significantly higher than in later sessions (Sessions 3 through 6) for overall behavioral

Table 1. Behavioral Compliance Percentages of Trained and Untrained (Control) Foodservice Employees

	Mean Compliance Percentage ± SE								
	Overall Behavior			Handwashing			Handling of Work Surfaces		
Time Period (20 minutes each)	Control Group (n = 92)	Trained Group (n = 64)	Total	Control Group (n = 81)	Trained Group (n = 55)	Total	Control Group (n = 19)	Trained Group (n = 12)	Total
1	37.50 ± 2.85	51.22 ± 3.42	44.36[a] ± 2.23	32.13 ± 3.19	42.19 ± 3.87	37.16[a] ± 2.51	77.28 ± 6.71	88.00 ± 8.44	82.64[a] ± 5.39
2	33.67 ± 3.05	46.66 ± 3.66	40.17[b] ± 2.38	29.50 ± 3.46	42.68 ± 4.20	36.09[b] ± 2.72	61.05 ± 8.58	55.28 ± 10.80	58.17 ± 6.90
3	30.10 ± 2.96	42.68 ± 3.55	36.39 ± 2.31	23.02 ± 3.14	37.07 ± 3.81	30.05 ± 2.47	53.60 ± 9.57	71.67 ± 12.05	62.63 ± 7.69
4	26.99 ± 2.91	39.20 ± 3.49	33.10 ± 2.28	20.92 ± 3.15	35.56 ± 3.83	28.24 ± 2.48	60.18 ± 10.07	65.28 ± 12.67	62.73 ± 8.09
5	35.91 ± 3.06	37.57 ± 3.67	36.74 ± 2.39	28.87 ± 3.35	29.67 ± 4.07	29.27 ± 2.63	51.40 ± 8.25	79.29 ± 10.38	65.35 ± 6.63
6	30.32 ± 3.28	37.17 ± 3.93	33.74 ± 2.56	22.69 ± 3.21	29.69 ± 3.89	26.19 ± 2.52	60.78 ± 9.33	69.58 ± 11.74	65.18 ± 7.50
Mean Compliance	32.42 ± 2.20	42.42 ± 2.64		26.19 ± 2.41	36.14 ± 2.93		60.71 ± 6.73	71.52 ± 8.47	
Test Statistic [c]			*F* (5, 770) = 5.72***			*F* (5, 670) = 5.57***			*F* (5, 145) = 2.87*

Note. Compliance percentages were calculated by dividing the number of food safety related behaviors performed correctly by the number of times the behaviors should have been performed correctly, and multiplying by 100.
There were too few observations on use of thermometers to perform that individual analysis; however, data related to thermometer usage is included in the calculations for overall behavioral compliance.
* p < .05, ** p < .01, *** p < .001
[a] Compliance in the first session was significantly higher than all later sessions, for the group of employees as a whole (p < .001).
[b] Compliance in the second session was significantly higher than all later sessions, for the group of employees as a whole (p < .01).
[c] Test statistics below the Total column represent within subjects (six observation sessions) analyses.

compliance [F (1, 154) = 6.54, p < .01] and handwashing [F (1, 134) = 13.12, p < .001]. These results support that the observer's presence does influence employees' behavior and that they become habituated (their compliance levels decrease and level off) after approximately one hour. In each analysis, the interaction effect between group and compliance rates over the six sessions was not significant, indicating the observer's presence influences the groups similarly.

There was an expected main effect of training. The trained group had significantly higher overall behavioral compliance [F (1, 154) = 8.46, p < .01] and handwashing compliance [F (1, 134) = 6.89, p < .01] than the control group. The groups had similar compliance rates for handling of work surfaces [F (1, 29) = 1.00, *ns*].

Data analysis for the use of thermometers could not be conducted because there were a limited number of observations for use of thermometers. Thermometer use data were included in the overall compliance calculations and is reflected in the trends for the overall compliance percentage.

DISCUSSION

This study sought to determine whether employees adjust their compliance with food safety guidelines when they know they are being observed for food safety purposes, if there is a point at which employees become habituated to the observer's presence. It also evaluated how being trained in food safety influences the adjustment of food safety compliance rates. Results revealed that employees adjusted their behaviors, but became habituated to the researcher's presence after approximately one hour. Further, both employees who are trained and untrained in food safety appear to exhibit this reaction when aware of being observed.

Implications for Outside Observers

This study showed evidence of habituation among employees when being observed for food safety compliance. This result is consistent with research findings when observing interactions between mothers and their young children (Zebiob et al., 1979) and between mental health technicians and patients (Hagen et al., 1975). Foodservice employees had significantly higher compliance rates in the first hour compared to the remaining sessions. It appears that it took about an hour for the employees to become acclimated to the researcher's presence. Support for this habituation effect is enhanced in that the effect was displayed for multiple behaviors: handwashing, handling of work surfaces, and the overall compliance composite. Insufficient use of thermometers did not allow testing the effect for that behavior.

The finding that habituation occurs after approximately one hour into the observation has potential implications for researchers using an observational methodology while investigating restaurant food safety compliance. These researchers may benefit from disregarding data collected during the first hour to achieve a more accurate indication of employees' typical compliance rates. Collecting accurate data is the key to informing good decision-making and useful policy change.

The finding also has potential implications for restaurant health inspectors. Typically, health inspections are conducted within one hour. The results suggest that inspectors may need to observe restaurant employees in excess of an hour to view more typical behaviors. It is important to note that food safety guidelines that do not involve observing employees behavior directly could be checked immediately (the hotline and coldline are at appropriate temperatures, leftovers have been discarded after seven days); it is behavioral data (handwashing, etc.) that requires time for habituation to occur. Increasing inspection times is an easy recommendation, but it would be difficult to implement. Increasing inspection times to allow for habituation would increase the number of inspectors required in each county as well as the cost of the inspections for the restaurants (i.e., increased licensing fees) and for the public (i.e., taxes used to compensate for inspection costs). Because of low profit margins, economic changes, and increased fees and taxes (Spector, 2003), restaurateurs are unlikely to react favorably to such a recommendation. The public's reaction may be mixed given the increase in taxes, yet it would enhance the ability to gain accurate information about restaurant employees' compliance with guidelines. The more accurate data could be used to train and retrain employees, reinforce positive food safety behaviors, and inform policies to make restaurants safer for consumers.

The results show that food safety trained and untrained employees responded similarly to the observers' presence. Both groups exhibited higher compliance within the first hour of the observation. The results are consistent with social desirability theory (Crowne & Marlowe, 1960; Helmes & Holden, 2003), which suggests that both employee groups would try to improve their behaviors when being observed. The results provide evidence that researchers using observational methodologies do not need to approach observations of trained and untrained employees in a different manner.

Implications within the Foodservice Operation

The results showing higher compliance rates in the first hour of the observation show that, regardless of trained status, foodservice employees may frequently work at levels below their capacity for compliance. This indicates inconsistent motivation among foodservice employees who either forget to perform the behaviors or do not understand the implications of improperly performing food safety practices. Clearly, foodservice employees need more motivation to perform food safety practices consistent with their actual capacity.

Keeping the importance of complying with food safety guidelines salient among foodservice employees is essential. The mere presence of the researcher achieved this, but employees became acclimated to the observer's presence and their motivation for compliance waned after approximately one hour. Foodservice managers must make constant efforts to motivate employees about food safety; based on the results of this study this should be done once per hour, at minimum. As examples: 1) when passing through production areas, reinforce the proper practice of food safety behavior; 2) install a bell that rings every time employees use the handwashing sink to remind employees about safe handwashing practices; 3) post bright signs in high-traffic production areas to remind employees of food safety guidelines (e.g., by the boxes of gloves to remind employees to wash hands before putting on new gloves); 4) communicate to employees that serious consequences could occur if food safety practices are not performed properly (e.g., serious illness for the customers AND employees, death, restaurant closure). Frequent verbal reminders may be even more effective than the mere presence of an outside observer in encouraging the employees to use additional effort to perform at their actual capacity. Ongoing verbal reminders would provide evidence to employees that they are under constant surveillance. While the current study did not test the best source of these reminders, it seems most feasible for the frequent reminders to come from supervisors. Foodservice supervisors and managers are most likely to be present to give such reminders, have authority to give these reminders, and have the most to lose if employees do not follow compliance guidelines. It is ultimately the managers' responsibility to monitor employees' behavior to ensure compliance with food safety guidelines.

Limitations and Future Directions

The major limitation of the study was recruiting restaurant employees. Difficulty existed in gaining consent of managers, which was necessary for the observational portion of the study. Of 1,298 restaurants contacted, only 31 managers participated. Most managers indicated that they did not have time to participate. Many managers were uncomfortable allowing researchers into their operation to observe employees' compliance with food safety guidelines, even though they were assured that all data would remain confidential and that any food safety related concerns would be reported to the manager (not the health department). Failure of the managers to agree to participate decreased the researchers' access to the sample of interest.

The time between the actual training and observations is another limitation. In this study, the observations were conducted within one to two weeks of training. Due to this, the information presented in the training may have been fresh in the employees' minds. Observing employees at a later date may influence the outcome of the study. However, scheduling observations at a later date may result in a loss of subjects due to the high turnover rate in the foodservice industry.

Participants were limited to restaurant employees within a 300-mile radius of the research institution, which included restaurants in Kansas, Missouri, and Iowa. Future research should be conducted in other geographic areas to determine the generalizability of these results.

The current study focused on foodservice employees in restaurants. Future research investigating the effects of observing foodservice employees during food production should target employees in other sectors such as foodservice employees in healthcare, school, childcare, and senior living foodservice environments. Given that observational research is frequently conducted in these environments (Henroid & Sneed, 2004; Sneed & Henroid, 2007; Sneed, Strohbehn, & Gilmore, 2004; Strohbehn et al., 2008), and also given that these employees prepare food for populations at a higher risk of contracting a foodborne illness, it is important to determine if and how these employees' behaviors are influenced by being observed for compliance with food safety guidelines.

Future research should involve testing for the best source of increased salience for the importance of complying with food safety guidelines. As suggested above, supervisors may be the most likely source of reminders; however, this study did not test for that. Future research could compare the effects of an outside observer, reminders from managers, and reminders from coworkers. While it is managers' ultimate responsibility to ensure employees' compliance with food safety guidelines, it may be difficult to get managers to consent to participate in such research. Recruitment of foodservice employees was extremely challenging; recruitment of managers may be equally, or even more challenging.

Other ideas for future research include: 1) investigating whether the results are only applicable to observations of employees' compliance with these selected food safety practices, or whether they are applicable to all food safety practices, and 2) determining the generalizability of the results to observing other types of behaviors besides food safety practices.

CONCLUSION

Both trained and untrained foodservice employees perform below their true capacity for compliance, as evidenced by their initial elevated levels of compliance when being observed. The presence of an observer may influence foodservice employees to exhibit higher compliance with food safety guidelines for approximately an hour. When employees know they are being observed for food safety behaviors, researchers and health inspectors may obtain a more accurate estimation of compliance rates after the first hour. Foodservice managers may be able to increase salience of complying with food safety guidelines by providing verbal reminders to employees emphasizing the importance of this compliance; this may spark additional motivation to properly perform food safety practices.

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