

Explaining unobserved heterogeneity of food safety behavioral intention:

A sequential mixed method approach

by

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B.S., Royal Melbourne Institute of Technology, 2005
M.S., Kansas State University, 2015

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

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Department of Hospitality Management
College of Human Ecology

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Abstract

In 2015, 902 foodborne illness outbreaks were reported to the Centers for Disease Control and Prevention, resulting in 15,202 illnesses, 950 hospitalizations, and 15 deaths. Previous literature from both survey and observational studies have reported low conformity with the U.S. Food and Drug Administration (FDA) Food Code guidelines. To effectively reduce foodborne illnesses, foodservice managers and food handlers must perform proper food safety behaviors. Therefore, the purpose of this project is to identify and explain the unobserved cognitive processes within food safety behavioral intention.

An explanatory sequential mixed methods design was utilized. First, a systematic review and meta-analyses of the existing literature were conducted to quantify statistical power better and summarize the effect sizes with conflicting studies. Then, an in-depth qualitative study was conducted to help explain the statistical results. Using existing observed cognitive variables grounded by the Theory of Planned Behavior, the key idea is that the qualitative inquiry was built on the quantitative results. Thus, the syntheses of both studies help explained the unobserved heterogeneity information.

Study 1 included a total of 1,550 studies for screening with 46 records meeting the inclusion criteria for analyses. The overall random effect size (r) was 0.282 ($p < 0.001$) providing collective evidence that the TPB constructs predict food safety behavioral intention. Subjective norms were noted as the most influential variable to food safety behavioral intention. Studies with employee motivational constructs tend to show the most positive effect on food safety intention relationships. However, the Theory of Planned Behavior model only explained a combined 22% of total true effect variance. Thus, a considerable amount of the variance (78%) within food safety behavioral intention is still unexplained.

Study 2 used an online questionnaire to measure individual-level norms. Open-ended questions (14) helped create qualitative narrative texts for analyses and establishing a demographic profile of the participants. A total of 104 responses from foodservice and restaurant employees were documented for coding. Most participants were female, with a mean age of 36 with an average of about 11 years of foodservice industry experiences. The results indicated that employees are usually not influenced of other managers or coworker's approval or disapproval of their behavior. Rather, their behavior is guided by an innate motivation for moral consideration and ethical reasoning. The data further indicated that participants experience injunctive (subjective) norms, but more from a retrospective formation, rather than a forward-looking expectance regarding food safety practices. Intrinsic motivation should be an important antecedent to form normative beliefs of food safety-related behaviors. The findings of the study results challenge the previous understanding of path directions regarding normative pressure. Limitations and future studies related to maximize food safety behavioral intentions were discussed.

Keywords: Heterogeneity Ratio, Descriptive Norms, Theory of Planned Behavior, Meta-Analyses, Explanatory Design.

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Approved by:

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Dr. Kevin R. Roberts

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Dedication

I would like to dedicate this research project to great faculty mentors at K-State, whose dedicated words, frustrate, and challenge me and make my work stronger for it.

Chapter 1 - Introduction

Many industries around the world are showing an increased interest in a workplace safety culture as a means of reducing the potential for disasters and accidents (Antonsen, 2017; Griffith, Livesey, & Clayton, 2010a). The evidence-based guidelines of employee safety behavior have frequently been updated within industries such as medicine and aviation, but has rarely been conducted within the food safety industry with foodservice employees (Jespersion, Griffiths, & Wallace, 2017; Young, Thaivalappil, Reimer, & Greig, 2017). One of the possible reasons is the lack of meticulous reviews of all empirical scientific research in response to workplace safety practices (Griffith et al., 2010a). Thus, reviews of food safety culture and human dimensions of behavioral antecedents related to food safety behavior are needed (Ong, Frewer, & Chan, 2017). Moreover, the concept and importance of a food safety culture are poorly understood by all levels of management, especially middle and top management (Griffith et al., 2010b; Jespersen et al., 2017). Thus, in 2015, 902 foodborne illness outbreaks were reported to the Centers for Disease Control and Prevention (CDC), resulting in 15,202 illnesses, 950 hospitalizations, and 15 deaths (CDC, 2017).

As in previous years, restaurants were still the most commonly reported location of foodborne disease outbreaks (469) and associated illnesses (4,757) (Angelo, Nisler, Hall, Brown, & Gould, 2017; CDC, 2017). Moreover, previous literature from both survey and observational studies has reported low conformity with the Food and Drug Administration's (FDA) Food Code guidelines (FDA, 2013, 2017; Green et al., 2007; Strohbehn et al., 2008; Roberts et al., 2009, 2010). To effectively reduce foodborne illnesses, foodservice managers and food handlers must perform essential food safety behaviors (Debess et al., 2009; Green et al., 2005, 2007). Within the United States, several causes of non-conformity have been identified, such as failing to

adhere to safe food preparation time and temperature guidelines, introducing pathogens while preparing food when ill, or cross-contaminating ready-to-eat foods with raw food (Debess et al., 2009; Green et al., 2005, 2007).

When foodservice managers and employees are on-the-job, food safety knowledge does not always translate into improved behaviors or attitudes (Howes, McEwen, Griffiths, & Harris, 1996; Kwon et al., 2012; Ong, Frewer, & Chan, 2017; Roberts et al., 2008; Roberts & Barrett, 2009). As Frank Yiannas, past-president of the International Association for Food Protection, writes in his book:

“going beyond traditional training, testing, and inspectional approaches to managing risks. It (achieving food safety success) requires a better understanding of organizational culture and the human dimensions of food safety. To improve the food safety performance of a retail or foodservice establishment, an organization with thousands of employees, or a local community, you must change the way people do things. You must change their behavior. In fact, simply put, often food safety equals behavior.” (Yiannas, 2009, p. 1)

However, behavioral resistance has been a core theme within both the American subculture and the sociological scholars who study them (Hebdige, 1979; Hall & Jefferson, 1976). Early in the 1970s, subcultures emerged in America posting resistance to dominant authority, to what the young working-class men saw as an oppressive society (Wooden & Blazak 2001). Subcultures often inadvertently reinforce rather than subvert mainstream values, recasting dominant relationships in a subversive style (Young & Craig, 1997). When developing behavioral interventions to improve food safety behaviors, such subversion can undermine the

authority of management and resolve team members to defy orders from management personnel (Young & Craig, 1997; York et al., 2009). Whereas some non-conformity behavior may affect food quality, others may have a significant impact on foodborne disease outbreaks or business failure (Scharff, 2012). Foodservice operations often suffer significant damage, both in brand identity and financial losses, due to one foodborne illness outbreak, forcing a third of all foodservice operations who experience a foodborne illness outbreak into bankruptcy (Griffith, 2000; Scharff, 2012).

Statement of Problem

Behavioral resistance and failure to comply with proper food safety practices are both widespread and problematic (Roberts et al., 2008, 2009; Roberts & Barrett, 2009, 2011). Environmental health inspections within the public sector (CDC, 2016) and audit reports from the private sector of food businesses (Egan et al., 2007; Valerie et al., 2008) have identified varying, and often significant, degrees of non-conformity behavior with the most basic of food safety requirements. It has been suggested that 97% of outbreaks traced to non-manufacturing food businesses involved food handler error or malpractice (Howes et al., 1996; Griffith, Livesey, & Clayton, 2010b). In a positive organizational culture, food safety is an important business objective, and there is conformity with documented food safety systems. In a negative organization environment, food safety is not perceived of prime importance, and often other business priorities take precedent, and there is poor conformity with proper food safety practices (Griffith et al., 2010b).

Although behavioral resistance to food safety behavior has caused considerable attention, some researchers argue that some aspects of food safety behavior or behavioral intention can be

improved with food safety knowledge or additional food safety training (Jevsnik, Hlebec, & Raspor, 2008; Omemu & Aderoju, 2008; Williamson, Gravani, & Lawless, 1992). However, this model has been criticized by many (Ehiri et al., 1997; Griffith, 2000; Pilling et al., 2008; Sniehotta, 2009; Sniehotta, Presseau & Araujo-Soares, 2014; Verplanken & Wood, 2006; York et al., 2009), who argue that individuals who obtain knowledge and skills during training programs often fail to act when they return to work (Egan et al. 2007; Griffith, 2000; Roberts & Barrett, 2009, 2011; Sniehotta et al., 2014; Verplanken & Wood, 2006).

This behavioral resistance issue has encouraged foodservice researchers over the past decade to examine the gaps of food safety knowledge and actual work-related food safety behavior (Arendt, Paez, & Strohbehn, 2014; Roberts et al., 2008), so that evidence of effective food safety training or improvements of post-training behavior can be recorded. Collective research suggests that further exploring food safety behavioral resistance and effective behavioral-based training may be an important direction for future research (Angelo et al., 2017; Green et al., 2007; Green & Selman, 2005; Howes et al., 1996; Kwon et al., 2012; Roberts et al., 2008). Inspired by behavioral change theories, some studies have employed different theoretical approaches to examine why food handlers choose not to implement known food safety practices (Arendt et al., 2012, 2014; Roberts et al., 2009, 2010). As human behavior is better understood in its behavioral-related environment (Lowe, Norman, & Sheeran, 2017), it is crucial to examine food safety behavioral actions within the appropriate work environment. Thus, any potential conflicts that cause behavioral resistance and barriers to proper food safety practices can be identified.

However, in foodservice management, the assumption that the data stem from a single homogeneous population is often unrealistic and often leads to limitations in the implications for

practices. One of the common indications of the limitations is the weak predictability and low proportion of explained variances (R^2) within the targeted safety behaviors (Godin & Kok, 1996; McEachan, Conner, Taylor, & Lawton, 2011). According to previous studies, using the best available cognitive antecedents like attitudes, norms, self-efficacy, perceptions of risk and severity, and personality factors collectively explained about 44% of the variance in health-related behaviors (Sheeran, Harris, & Epton, 2014; Sheeran, Klein, & Rothman, 2017; Sheeran & Webb, 2016). Furthermore, using one of the most fundamental and influential theories of behavioral change, the Theory of Planned Behavior (TPB), attitude, subjective norms, and perceived control only accounted for 24% of the total variance within behavioral intention (Godin & Kok, 1996; McEachan et al., 2011; Sheeran & Webb, 2016). Therefore, a significant proportion of variance within behavioral intention is unexplained (Sheeran, 2002; Sheeran & Webb, 2016), suggesting a role for other predictor variables and room for improvement.

Although high-quality, systematic syntheses are frequently conducted with other health-related behaviors, the meta-analyses are rarely conducted with food safety behaviors (Egan et al., 2007; Ong, Frewer, & Chan, 2017). Thus, the explained variance within food safety behavior remains low, and the predictability of food safety behavior often relies on antidotal evidence from studies conducted with populations other than foodservice employees.

Justification

Evidence suggests that exploring effective behavioral-based food safety programs and examining relative cognitive dissonance to food safety behavior may be an important direction for future research (Angelo et al., 2017; Howes et al., 1996; Kwon et al., 2012; Roberts et al., 2008). A systematic review and qualitative synthesis explaining food safety behavior and their

cognitive process and barriers to food safety behavior tends to be sparse. To facilitate an understanding of the cognitive dissonance between knowledge and behavior, thoroughly integrating previous studies on cognitive dissonance, in the food and nutrition context is needed (Ong, Frewer, & Chan, 2017). However, a literature search only yielded two systematic review articles related to cognitive food safety behaviors (Campbell et al., 1998; Egan et al. 2007). Moreover, their reviews were mostly narrative, did not address the bias that may be present in the reviewed literature, and dates back more than ten years. Additionally, none of the review articles (Campbell et al., 1998; Egan et al., 2007) conducted a meta-analysis or synthesized study-level effect sizes. Both review articles focus on summarizing the data on food safety educational effectiveness (i.e., improved knowledge or inspection scores) not on food safety behaviors. As previously discussed, this model has been criticized by many. Thus, there is an urgent need to conduct an up-to-date, systematic review and meta-analyses to synthesize existing evidence on cognitive dissonances to food safety behaviors.

The Theory of Planned Behavior (TPB) is one of the most fundamental and influential theories of behavioral change (Sheeran et al., 2014, 2016; Sheeran & Webb, 2016). Various correlational studies indicate that intentions predict behavior (Sheeran, 2002). Moreover, intention offers a superior prediction of behavior in correlational tests compared to other cognitions, including explicit and implicit attitudes, norms, self-efficacy, perceptions of risk and severity (Sheeran et al., 2014), and personality factors (Chiaburu et al., 2011). The authors of the meta-analysis noted that of 185 independent studies published up until the end of 1997, the TPB accounted for 27% and 39% of the variance in behavior and intention, respectively (Armitage & Conner, 2001). When behavior measures were self-reported, the TPB accounted for 11% more of the variance in behavior than when behavior measures were objective or observed ($R^2 = .31$

and .21, respectively) (Armitage & Conner, 2001). Although a large proportion of variance within behavioral intention is still unexplained (Sheeran, 2002; Sheeran & Webb, 2016), the collective information suggest there are roles for other predictor variables and room for improvement (Sheeran & Webb, 2016).

Purpose and Objectives

The purpose of this project is to identify and explain the unobserved cognitive process within food safety behavioral intention, which is not necessarily captured by variables that are preconceived by the researcher from existing empirical studies and/or specified by existing theory. The long-term objective of this project is to report findings from this research to improve food safety behaviors among foodservice workers.

Research Questions

- RQ₁: Do attitude, subjective norms, and perceived control have a significant random-effect on food safety behavioral intention among foodservice workers?
- RQ₂: Do gender, age, and work experience moderate the relationship between attitude and intention, subjective norms and intention, and perceived control and intention?
- RQ₃: Are there any influential outliers consider in observed effects between food safety attitude, subjective norms, and perceived control to food safety behavioral intention?
- RQ₄: What are the main factors that affect the descriptive beliefs of an individual foodservice employee?
- RQ₅: What are the main factors that affect the normative beliefs of an individual foodservice employee?

RQ₆: What are the share believes in the group that affects the food safety practices of an individual foodservice employee?

Significance of the Project

To help explain the variance within food safety behavioral intention, and ultimately improve food safety behavior, this project has several expected contributions. One possible contribution of the project is to explain *unobserved heterogeneity*, which is not necessarily captured by variables that are preconceived by the researcher from existing empirical food safety studies or specified in the TPB-related literature. Through the integration of new moderators or contextual variables uncovered through the explanatory process, additional post hoc data-driven improvement of results might be identified and explained. Thus, using the results of the study, future studies can use the evidence discovered from this project to help plan future investigations to improve the current results of the *observed heterogeneity* within food safety behavior (Jedidi et al., 1997; Van de Ven, 2007).

Additionally, this study help explain the unobserved heterogeneity information using qualitative inquiries. Previous studies have tested whether additional cognitive constructs such as *descriptive norms* and *self-identity* can improve more general behavioral prediction (Rise, Sheeran, & Hukkelberg, 2010; Ravis & Sheeran, 2003). However, these constructs only concern a single health behavior, thus lacking generalizability towards more specific food safety behaviors. By using an additional qualitative study, the researcher anticipates new information within complex food safety behaviors to improve general predictability in behavioral intention and avert future validity threats about performing structural equation modeling with food safety-related constructs.

One of the methodological contributions including the use of both deductive and inductive analysis procedures, the researcher is able to investigate and resolve anomalies in the data. The qualitative follow-up can explore the attitudes, subjective norms, and perceived control related to food safety behaviors in a systematic and holistic fashion, meanwhile elaborate the conflict conclusions raised in the previous literature.

Next, this project aims to resolve conflicting theoretical information regarding *perceived control* to be either a poor predictor (Lin & Roberts, 2017) or strong indicator of intended food safety behavior (Campell et al., 1998; Egan et al. 2007; McEachan et al., 2011). One possible explanation for this conflict is that researchers applying the TPB to predict food safety behaviors vary in how they have measured perceived control. Perceived control has been measured as either perceived control only (e.g., ‘Whether or not I engage in hand washing behavior is under my control’, Lin & Roberts, 2017), Self-efficacy only (e.g., ‘If I wanted to, I am confident that I could engage in hand washing behavior’, Lin & Roberts, 2017), or a combination of *perceived control* and *self-efficacy* (e.g., Cooke, Sniehotta, & Schuez, 2007).

Another theoretical contribution includes the examination of possible moderators or contextual variables of the TPB relationships within the foodservice industry. For example, Sheeran, Godin, Conner, and Germain (2017) found that *experience* can produce a quadratic relationship between intentions and behavior, thus *experience* can be an important moderating variable. On the one hand, *experience* could make one’s intentions to perform that behavior more stable or accessible (Doll & Ajzen, 1992). With greater experience, workers should have stronger intention to perform the food safety behaviors. On the other hand, greater experience is associated with increased automatization of behavioral performance. The more often one has performed a behavior in the past, the more likely it is that the action sequence becomes a habit,

and consequently, there is less need for a conscious intent to guide behaviors (Wood & Neal, 2007). However, this habitual behavioral performance and the moderator information remains unknown within the foodservice literature (Sheeran & Webb, 2016; Sniehotta, 2009; Sniehotta et al., 2014; Verplanken & Wood, 2006). Given this, *working experience*, *age*, and *gender* could all be examined as the potential moderator variable which may contribute to further understanding of the worker's cognitive process.

In terms of practical implications, government authorities often rely on high-quality systematic reviews to update policies and regulations, then provide best practice guidelines to help the industry (Dixon-Woods et al., 2006). A meta-analysis provides high-quality evidence in a holistic fashion, which helps summarize conflicting study results, identifying unobserved heterogeneity for future investigations, and generating new hypotheses based on collective justifiable evidence from multiple studies (Deeks, Altman, & Bradburn, 2008). Regarding improving food safety behaviors, qualitative study that incorporate meta-analyses can help identify effective intervention agents, suggest cost-effective training strategies, and revise managerial practices that serve as important guidelines for operators (Ham-Baloyi et al., 2016).

Limitations

One of the main limitations of this study was the language used, as it only include studies published in English. Although other languages can be translated and included, the lack of reporting standards, Institutional Review Board for Protection of Human Subjects in Research (IRB), and incomparable library indexing system pose technical difficulties to accessing the quality and ethical standards of studies published.

Food safety behavior or food safety intervention practices may be addressed using a great range of different sampling populations and vastly different behavioral theories. Studies with insignificant findings or that are contradicting to the popular understanding may often go undocumented or may not have been published (Rosenthal, 1991). However, during a systematic review, the insignificant finding or unpublished data can be a valuable source of empirical data, thus can be synthesized as empirical evidence. Although some results could be from human error or malpractice, the quality of the results can be evaluated individually and serve as important raw data for calculation or as formative indicators for part of the original behavioral construct. Thus, this project would potentially be biased due to the lack of access to the unpublished data. Other technical difficulty include the mathematical calculations being less precise than using the original datasets, as the statistics being reported in the report or table often evened out due to journal or formatting guidelines.

Another limitation involves the qualitative sampling and analyses being used in this project. The qualitative analysis with two phases of data collection often is a recursive process, which refers to the development back and forth between different steps, also known as circular analysis (Kriegeskorte, Simmons, Bellgowan, & Baker, 2009). The results of a circular analysis would help with validation and accuracy. However, a longer-term quantitative study or repeated qualitative procedures could make participants more aware of study design and theme-relevant materials, thus produce biased results or transcripts more related to the investigator's apparent desire of the finding rather than the participants' understanding.

One of the methodological limitations is the open-ended questionnaire process via the internet. The inability to capture the nonverbal language of the participant is a limitation.

However, to minimize this effect, the qualitative study was digitally recorded and was used reflectively during the analyses.

At last, during the qualitative study, there was a time delay between recruiting participants for survey to participate in an open-ended questionnaires, which could cause participants to have limited memory recall. To minimize memory as a potential threat to credibility, participants were asked to think about previous survey questions at the beginning of the open-ended questionnaire.

Definition of Terms

Attitude: An individual's evaluation of the likelihood that a particular behavior will lead to the desired outcome (Fishbein & Ajzen, 2011).

Behavior: Any behavior can be defined regarding four elements: the action, the target at which the action is directed, the context in which it is performed, and its time of occurrence (Fishbein & Ajzen, 2011).

Behavioral Beliefs: The perceived consequences of an action (Fishbein & Ajzen, 2011).

Behavioral Intention (BI): A person's perceived likelihood or "subjective probability that he or she will engage in a given behavior" (Fishbein & Ajzen, 2011).

Control Beliefs: Beliefs about the likelihood that one possesses the resources and opportunities thought necessary to execute a behavior (Fishbein & Ajzen, 2011).

Cross Contamination: Cross-over of raw and finished products, contacts between walls or floors and food ingredient and poorly drained floors or ready-to-eat food product (FDA, 2009).

Descriptive Norms: Perceptions about what important people do (Cooke et al., 2006).

Foodborne Illness: An illness that is transmitted to people by food (FDA, 2013).

Foodborne Disease Outbreak: The occurrence of two or more cases of a similar illness resulting from the ingestion of a conventional food (FDA, 2013).

Foodservice Worker: An individual who handles food for others to consume either in a commercial facility or non-for-profit institutionalized environment (Byrd-Bredbenner et al., 2008).

Injunctive Norms: Perceptions about what important people think a person should do (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007).

Mishandling: The mishandling of food that can lead to contamination or impurity, falsification of contents, or loss of food quality. Mishandling may cause injury or illness to the consumer (FDA, 2009)

Mixed Methods Design: Mixed methods research is an approach to an inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks. The core assumption of this form of inquiry is that the combination of qualitative and quantitative approaches provides a complete understanding of a research problem than either an approach alone (Creswell, 2014).

Motivation to Comply: The extent to which a person feels inclined to match his or her behavior to various sources of social pressure (Bearden, Netemeyer, & Teel, 1989).

Multiple Methods Design: Two (or more) complete studies using different methods, and addressing the same *aim*, and a third study integrating the results of the first two (Creswell, 2014).

Normative Beliefs: Perceptions of significant others' preferences about whether one should perform a behavior (Fishbein & Ajzen, 2011).

Outcome Evaluation: Evaluation of the perceived consequences of an action (Fishbein & Ajzen, 2011).

Perceived Control or Perceived Behavioral Control (PBC): An individual's belief about the control that helps or hinders the implementation of that behavior (Fishbein & Ajzen, 2011).

Phenomenology: The phenomenology is based on the understanding that individuals view the world in their unique ways and their vision is shaped by previous experience and the interpretation of that experience. This vision affects how they experience the world and how they live their lives (Husserl, 2012a, 2012b).

Random Effects Model: A model assumes that there is no common treatment effect for all included studies (Lau, Ioannidis, & Schmid, 1998) and the true effects for individual studies are assumed to vary around the overall average studies (Borenstein, Hedges, Higgins & Rothstein, 2009).

Self-efficacy: The conviction that one can successfully execute a given behavior (Ajzen, 1991).

Sequential Mixed Methods Design: Sequential mixed methods design, in which the core project is conducted with supplementary projects, commencing after sampling and data collection in the core project are complete (Creswell, 2014).

Subjective Norms (SN): A function of a set of beliefs concerned with the likelihood that important individuals, such as spouse, parents, or friend, would approve or disapprove of the behavior (Fishbein & Ajzen, 2011).

Theory of Planned Behavior (TPB): A theory that explains behavior as an antecedent of three variables: attitude, subjective norms, and perceived control (Fishbein & Ajzen, 2011).

Transferability: Transferability refers to the degree to which the results of qualitative research can be generalized or transferred to other contexts or settings (Trochim, 2005).

Triangulation: Triangulation involves using multiple data sources in an investigation to produce understanding and validity (Patton, 1990).

Validity: A property of measuring instruments or of responses, indicating the extent to which they measure what they are supposed to measure (Feldman & Lynch, 1988).

Chapter 2 - Literature Review

Foodborne Illness and Food Safety Behavioral Landscape

In 2015, 902 foodborne disease outbreaks were reported to the Centers for Disease Control and Prevention (CDC), resulting in 15,202 illnesses, 950 hospitalizations, and 15 deaths (CDC, 2017). The CDC (2016) estimates that one in every six Americans fall ill from a foodborne illness each year. The safety and easiness of dining outside of the home are one of the freedoms Americans enjoy (Knight, Worosz, & Todd, 2009). In fact, over the past three decades, retail food sales in the United States have soared approximately 1,800%, from \$42.8 billion in 1975 to a projected \$798.7 billion in 2017 (National Restaurant Association, 2017; Technomic Food Service Segment, 2004). At the same time, Americans have become increasingly dependent on restaurants and foodservice chains to prepare their meals (Nielsen, Siega-riz, & Popkin, 2002). In 1955, only 25% of the food is consumed in a restaurant, compared to almost half (48%) of U.S. food spending going toward food is eaten away from home in 2017 (Clauson, 1999; National Restaurant Association, 2017). However, according to the most recent government data, 51% of single-setting foodborne disease outbreaks were caused by food prepared in a restaurant (Angelo et al., 2017).

Consumers tend to rate hygiene standards as either “very important” or “important” to them when they decide where to dine (Worsfold, 2006). In a more recent survey, 98% of customers considered employee hygiene as a very important or important factor when dining in restaurants (Trendsource, 2016). Trendsource (2016) reported that 39% of consumers indicate that they would not return to a quick-service restaurant if it were involved in a foodborne disease outbreak. Meanwhile, the restaurant industry continues to serve more than 32 billion meals a year (National Restaurant Association, 2017). Given the number of meals served, a single

foodborne disease outbreak often results in significant financial liability with high costs for healthcare and loss of productivity (Frenzen, Drake, & Angulo, 2005; Roberts et al., 2014; Scharff, McDowell, & Medeiros, 2009).

Estimated health care costs alone have ranged from \$405 million annually for *E. coli* (Frenzen et al., 2005) to upward of \$7.1 billion annually for all foodborne illnesses in one state (Scharff et al., 2009). Likewise, additional litigation often lasts for years and is often linked to business foreclosure or a series of financial and brand deteriorations (Roberts et al., 2014).

The Environmental Health Specialists Network data has indicated that more outbreaks occur in sit-down restaurants than fast-food restaurants (Angelo et al., 2017; Bennett, Walsh, & Gould, 2013; Imanishi et al., 2014). Angelo et al. (2017) suggested several explanations for this observation. First, sit-down restaurants traditionally have a ‘cook-to-order’ production process in comparison to assembly serve production processes (or standard cooking protocols) often implemented in quick-service restaurants. ‘Cook-to-order’ food may be more prone to preparation errors due to the individual employee behaviors involved, thus predisposing consumers to foodborne illnesses (Byrd-Bredbenner et al., 2007). Second, a customer may be more likely to consume raw or undercooked products in a sit-down restaurant, including raw fish, oysters, beef, or eggs (Angelo et al., 2017; Bennett et al., 2015). Third, outbreaks in sit-down restaurants might be more likely to be detected because the food is usually consumed in group settings compared to individual customers at the quick-service restaurants, thus easily allowing persons to be identified sick and linked epidemiologically (Angelo et al., 2017; Bennett et al., 2015).

Lastly, many quick-service restaurants have standardized supplier guidelines, order more from larger, more reputable suppliers, and quickly transport food through centralized logistic

centers (Stank, Goldsby, & Vickery, 1999). As a result, previous high-profile outbreaks in quick-service restaurants are well documented (Maloni & Brown, 2006), and resulted in improvements in standard operations procedures and have decreased the number of outbreaks resulting from food consumed in quick-service restaurants (Kambhampati et al., 2016). Given the fact that the majority of outbreaks occur in full-service restaurants and involve errors related to food handling and preparation practices (Angelo et al., 2017), the future investigation is needed to address the issue of food safety behavior, also known as the “soft stuff” (Yiannas, 2008).

Food workers have also been identified as a major contributor to food-associated outbreaks (Angelo et al., 2016; Gould et al., 2013). Following safe food handling practices is essential to reduce foodborne hazards from farm to table, and minimize foodborne disease outbreaks (CDC, 2007; De Boeck et al., 2017). Furthermore, behavioral-related mishandling has been identified as the major cause of foodborne disease outbreaks (Angelo et al., 2017; Debess et al., 2009). Specifically, several important food safety behaviors have been identified which include but are not limited to proper food preparation procedures and personal hygiene (Angelo et al., 2017; Debess et al., 2009; Green et al., 2007; Green & Selman, 2005).

Often of concern are the three food safety behaviors usually identified by outbreak-investigators as the cause of most foodborne-related outbreaks. These include failing to adhere to time and temperature guidelines, directly introducing pathogens while preparing food when ill, or cross-contaminating raw foods with ready-to-eat foods or cooked foods (Angelo et al., 2017; Debess et al., 2009; Roberts et al., 2008). These results have remained consistent among the various age groups studied (i.e., young, elderly, employees, caregivers) and in different areas of production (i.e., school, home, and workplace; Chang, 2018; Green & Selman, 2005;

Kambhampati et al., 2016; Roberts et al., 2008; Viator, Blitstein, Brophy, & Fraser, 2015).

Given that all three behaviors are controllable, researchers have focused their efforts on improving food safety knowledge, attitudes, training, and behaviors (Medeiros et al., 2011; Roberts et al., 2008; Roberts & Barrett, 2009; Viator et al., 2015).

The traditional method of improving food safety behaviors has been through training and food safety certifications. Food safety training involves teaching employees the details of food safety tasks or duties assigned to them (FDA, 2009; Roberts et al., 2008). Food safety training has evolved in both scope and the amount of money invested by the government and industry (Blume, Ford, Baldwin, & Huang, 2010; Riggins & Barrett, 2008; Sivaramalingam et al., 2015). Previous studies have also reported food safety training is effective at improving sanitation inspection scores (Cotterchio, Gunn, Coffill, Tormey, & Barry, 1998; Kneller & Bierma, 1990), the microbiological quality of food (Cohen, Reichel, & Schwartz, 2001), and self-reported changes in food safety practices (McElroy & Cutter, 2004). Epidemiological studies have reported operations with certified food safety managers have fewer foodborne illnesses (Hedberg et al., 2006). Conversely, conflicting information exists, as some studies have reported that inspection scores for restaurants experiencing a foodborne disease outbreak are not significantly different from establishments which have not experienced an outbreak (Jones et al., 2004; Cates et al., 2009).

Cates et al. (2009) reported the presence of a certified food safety manager did not improve inspection scores, nor did it improve inspection scores related to time and temperature violations. Roberts et al. (2008), explored food safety knowledge and practices among independent and chain restaurant operations. When comparing scores of the three food safety behaviors (cross contamination, time and temperature abuse, and use of thermometers), only

knowledge increased significantly for one aspect of handwashing. Further observational studies have revealed that the non-compliance percentage for handwashing behavior increased significantly between pre- and post-training behavior (Roberts et al., 2008). Although food safety training has been shown to increase food safety knowledge and attitudes (Adrendt & Sneed, 2008; Roberts et al., 2008), more studies have advised that training and acquisition of food safety knowledge does not always lead to safe food handling practices (Clayton, Griffith, Price, & Peters, 2002; Roberts et al., 2008; Roberts & Barrett, 2009; Kwon et al., 2012).

The preponderance of research has shown that employees do not always apply what they have learned in their actual work (Almanza, Namkung, Ismail, & Nelson, 2007; Byrd-Bredbenner et al., 2007; Dharod, Pérez-Escamilla, Bermúdez-Millán, Segura-Pérez, & Damio, 2004; Green et al., 2007; Kwon et al., 2012; Howells et al., 2008; Roberts et al., 2008; Sneed & Henroid, 2007). One of the possible reason can be the lack of motivation to follow proper practices (Soon, Baines, & Seaman, 2012). Despite the effectiveness of training for improving knowledge, the training may be less effective for motivating people to use proper practices (Almanza et al., 2007; Byrd-Bredbenner et al., 2007; Dharod et al., 2004; Sneed & Henroid, 2007; Soon et al., 2012). Therefore, the ultimate responsibility for food safety rests on the people doing the behavior and their willingness to reduce the barriers of conformity (Roberts et al., 2008; Roberts & Barrett, 2009).

Previous literature from both survey and observational studies have reported low conformity with the Food Code recommended behavior (Green et al., 2005; U.S. Food and Drug Administration [FDA], 2013, 2017; Silk et al., 2012; Strohbehn et al., 2008). Conformity with food safety behaviors has become even more urgent over the past decade, and a surge of interest among foodservice researchers and regulators has turned more to behavioral theories to identify

essential practices or barriers to improving work-related food safety behaviors (Arendt, Paez, & Strohbehn, 2013; Roberts et al., 2008; Powell, Jacob, & Chapman, 2011). Studies guided by behavioral theory have provided clear guidelines and theory to recognize the patterns of food safety behaviors, their relative psychological differences among different foodservice organizations, and their heterogeneous environment-behavioral relationships (Arendt, Paez, & Strohbehn, 2013; Lin & Roberts, 2017; Powell, Jacob, & Chapman, 2011). For example, attitude toward practicing food safety behaviors can be an important predictor of actual food safety behaviors (Ellis et al., 2010; Lee et al., 2013).

Other studies (Frash et al., 2005; Mitchell et al., 2007; Pilling et al., 2008; Powell et al., 2011) have attempted to identify possible reasons of failures and environmental barriers for effective food safety practices. One of the possible issues resides in whether the organizational environment has contributed to the issue of non-conformity behavior (York et al., 2009). According to cognitive behavioral theories, food safety behavior is better understood in an environment of content-related background that could contemplate with behavioral actions (Lowe et al., 2017). As managers and employees receiving food safety training, a better understanding of the food safety behavior has to be investigated with employees currently working in a foodservice environment with relative environmental specific variables (Henroid & Sneed, 2004; Molenaar, 2009; Sniehotta Presseau, & Araújo-Soares, 2014). Foodservice employees are often most closely in touch with the barriers that exist only within the organization that inhibits proper safe handling practices. Therefore, researchers should seek an understanding of the ‘insider’ perspectives of the individual’s intention to change behaviors (Mitchell, Fraser, & Bearon, 2007). Especially, individual attitude and perceived behavioral control, which can often change role in different organizational environments, thus resulting in

differences relating to predicting, changing, and understanding food safety behaviors (Sniehotta et al., 2014). Such examples in the foodservice environment include: pressure with respect to time, inadequate facilities and supplies, lack of accountability, lack of involvement of managers and coworkers, lack of organizational policies, and motivation to implement risk aversion behaviors (Frash et al., 2005; Medeiros, Cavalli, & da Costa, 2012; Murphy, DiPietro, Kock, & Lee, 2011).

Previous studies with training interventions have shown great success with improving utilization or adherence to proper food safety practices (Arendt, Roberts, Strohbehn, Ellis, & Meyer, 2012; Arendt et al., 2014; Howells et al., 2008; Finch & Daniel, 2005; York et al., 2009). To mitigate barriers and encourage the adherence to food safety practices, certain organizational changes have been suggested. Among these, providing adequate material resources, encouraging supervisory and peer support, routine food safety training, promoting food safety culture, and an appropriate management style have been identified (Frash et al., 2005; Griffith et al., 2010a, 2010b; Jespersen, Griffiths, & Wallace, 2017; Medeiros et al., 2012; Murphy et al., 2011; Powell et al., 2011).

Given the contradicting evidence provided in the research, it is important for researchers to distinguish the quality of evidence and explore the collective behavioral dissonance within the existing food safety literature. As Ong, Frewer, and Chan (2017) stated, to understand the behavioral problem in foodservice, a thoroughly integration of studies from the existing literature is needed. Moreover, through proper integration of empirical studies, the structural perspective of food safety practices can be consolidated and contradicting evidences can be resolved in a holistic faction, thus future research directions could be identified.

The Philosophical Central Paradigm and Theoretical Justification

In terms of behavioral resistance, each theorist demands a broader understanding of individual background, which accounts for members' individualistic orientations (Blackman, 1995; Clarke & Newman, 1997; Widdicombe & Wooffitt, 1995) and contextual consciousness which view the behavioral environment in many layers rather than seeing them as static and uniform (Muggleton, 2000). Following German philosopher Edmund Husserl's analysis of subjective consciousness (Husserl, 1970; 2012b), who stated there is no cognition without consciousness. The key philosophical justification for the qualitative approach of this project follows the best evidence with the locus of cognition. As Husserl (1970; 2012b) inferred as the '*ego cogito cogitatum*,' which means "I feel, I imagine something. Therefore I perceive and think of something." '*Ego cogito*' cannot happen as an act per se, but is always bound to the '*cogitatum*,' namely to something that is (re)cognized. Simply put as if "I perceive, think, feel, imagine. Therefore I always perceive something, think of something, feel something, imagine something" (Brentano, 1944; 2014). The collective of '*ego cogito cogitatum*' is the phenomenon and the justification for the future behavior or conceptualization of the behavior individually.

With the philosophical positioning in the center of the cognition, the theoretical approach of the *epoché* or in English "eidetic reduction" can be implemented. "Eidetic reduction" focuses on the assumptions of the natural attitude that we regularly rely upon in everyday life (Husserl, 1970; 2012b; Sanders, 1982), and reduces iterative beliefs, the theoretical and pre-theoretical presuppositions, hypotheses and elements of knowledge which are usually involved in the constitution of a phenomenon (Eberle, 2013; Sanders, 1982). Elucidating all these presuppositions helps to clear the way from the particulars to the universal 'pure' essences. (Eberle, 2013, pg 186). Therefore, this study took the *epoché* approach of things, which focuses

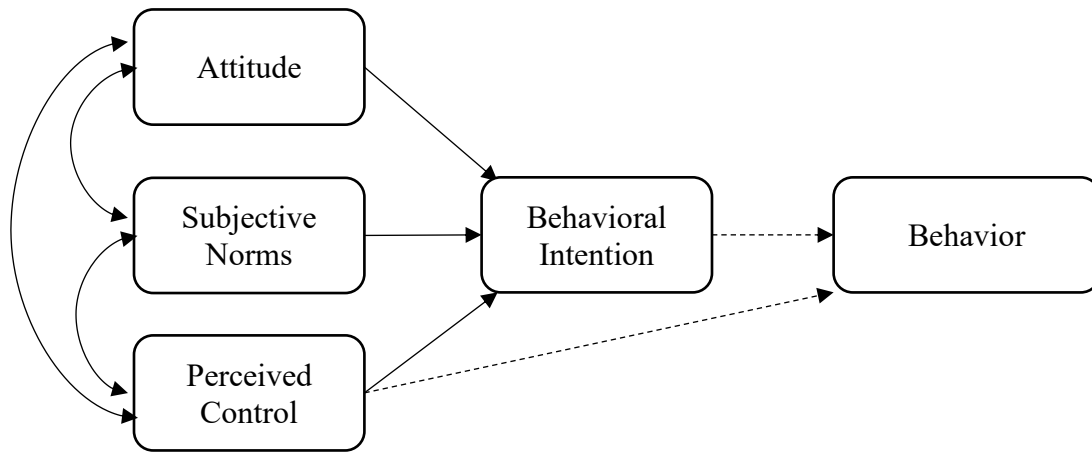
on phenomena (what we perceive and experience) rather than on the reality of things (what there is) (Clarke et al., 1975; Moran, 2001).

The Theory of Planned Behavior

One of the most influential theories of cognitive behavioral change is the Theory of Planned Behavior (TPB; Fishbein & Ajzen, 2011) or its predecessor, the Theory of Reasoned Action (TRA; Fishbein, 1979). The TPB assumes that human social behavior is reasoned or planned in the sense that people take into account the likely consequences of the behavior (behavioral beliefs), the normative expectations of important referents (normative beliefs), and factors that may facilitate or impede performance of the behavior (control beliefs) (Ajzen, 2011).

TPB and TRA focus on theoretical constructs concerned with individual motivational factors as determinants of the likelihood of performing a specific behavior (Fishbein & Ajzen, 2011). Derived from the TRA, the TPB (Figure 2.1) suggests three conceptually independent variables to determine behavioral intention. The first is the attitude, which refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior. The second predictor is the subjective norms, referring to the perceived social pressure to perform or not to perform a behavior. TPB is an extension of the TRA and adds an additional construct: perceived control over the performance of the behavior (Fishbein & Ajzen, 2011). Perceived control, which refers to the perceived difficulty of performing the behavior and is assumed to reflect experience and anticipated impairments or obstacles. In general, the more approving the attitude and subjective norms toward a behavior, the weaker the perceived behavioral control, the greater an individual's intention to perform the behavior (Fishbein & Ajzen, 2011).

Figure 2.1. The Theory of Planned Behavior



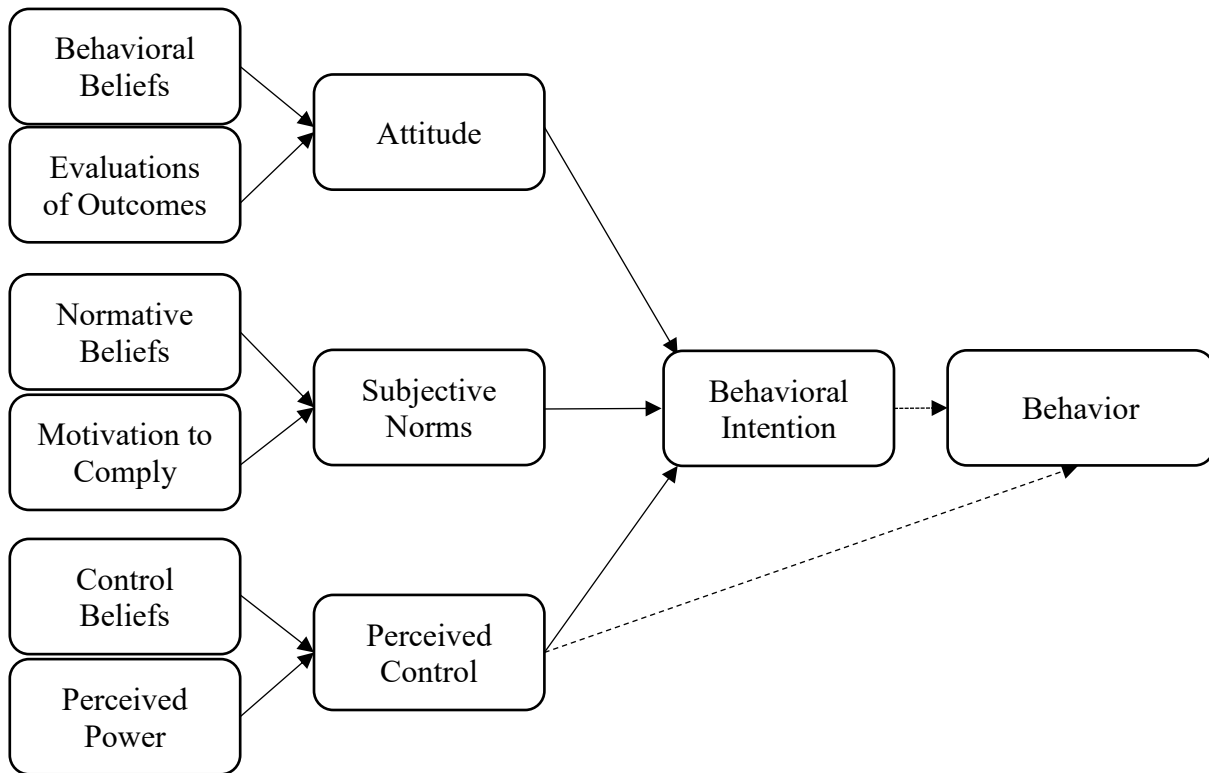
Note. Adapted from Fishbein, M., & Ajzen, I. (2011). *Predicting and changing behavior: The reasoned action approach*. London, UK: Taylor & Francis.

The TPB asserts that the most critical determinant of behavior is the behavioral intention. Direct determinants of individuals' behavioral intention are their attitude toward performing the behavior, their subjective norms associated with the behavior, and perceived control over the behavior, taking into account situations where one may not have complete volitional control over behavior.

In the context of the TPB, items of information in the form of beliefs are the basic building blocks of the behavioral intention (Fishbein & Ajzen, 2011; Figure 2.2). The likely consequences of the behavior (behavioral beliefs) are assumed to determine attitudes toward the behavior. Beliefs about the extent to which other people who are important think they should or should not perform particular behaviors (normative beliefs) are assumed to determine subjective norms (SN). Beliefs about potential facilitating or inhibiting factors (control beliefs) are assumed to determine perceived control (Perceived Behavioral Control [PBC]). When a measure

of actual control is unavailable, perceived control is used as a proxy under the assumption that perceived control reflects actual control reasonably well (Ajzen, 2005). Attitudes, subjective norms, and perceptions of control, in turn, combine to produce intentions that, together with actual control, determine the performance of the behavior (Ajzen, 1991). The TPB states that behavior is determined by an individual's behavioral intention and perceived control. The intention is held to be the motivational component that spurs an individual to engage in a particular behavior (Fishbein & Ajzen, 2011). The attitudes, subjective norms, and perception of behavioral control are thought to go along automatically and reasonably from these beliefs, producing a similar behavioral intention that can facilitate or inhibit the performance of the behavior (Ajzen, 1991).

Figure 2.2. The Theory of Planned Behavior in the Form of Beliefs



Note. Adapted from Fishbein, M., & Ajzen, I. (2011). *Predicting and changing behavior: The reasoned action approach*. Taylor & Francis.

Behavioral Belief and Attitude

Attitude is defined as the evaluation of the likelihood that a particular behavior will lead to the desired outcome (Fishbein & Ajzen, 1974). Attitude toward a behavior is assumed to have two components: beliefs (or cognitions) and evaluations (or effect) that work together to be a function of behavioral beliefs or the likely consequences of the behavior. For example, sending employees to wash their hands will decrease bacterial infections; therefore, washing hands is strongly desirable.

Behavioral beliefs are theorized to produce a positive or negative attitude toward the behavior (Ajzen & Driver, 1991). Results contribute to the overall attitude in direct proportion to the subjective probability that the behavior will produce the outcome in question (Zanna, Olson, & Fazio, 1980). For example, an employee might believe that it is extremely likely (subjective probability) that hand washing before preparing food will improve food quality (a positive outcome). This same individual may also believe it is unlikely that regular hand washing will increase work time (a negative result). Then, the presumed likelihood of experiencing positive consequences outweighs the presumed likelihood of adverse consequences of hand washing. Under an expectancy-value model of attitude (Ajzen & Fishbein, 2008; Feather, 1982), this person should hold a positive attitude toward regular hand washing before preparing food.

Because attitude is an evaluative response ranging from in favor to unfavored, Ajzen (1991) indicates that the strength of each behavioral belief (bb_i) is multiplied by the evaluation of its consequence (be_i), and attitude is a summation of the cross products. The calculation of attitude can be described as $Attitude = \sum_i bb_i be_i$ (Fishbein & Ajzen, 2011).

Normative Belief and Subjective Norms

Normative beliefs constitute the basis for perceived social pressure, also known as subjective norms. Subjective norms are a person's perceptions that important others prescribe, desire, or expect the performance or nonperformance of a specific behavior (Ajzen, 1991; Fishbein & Ajzen, 2011). The personal level of descriptive norms refers to an individual's beliefs regarding the behavior itself, those who are significant to the respondent or whose opinion the respondent values. Societal norms explain why individuals from different cultures and societies perceive different social expectations (Ryan & Deci, 2000).

The overall strength of the subjective norms are determined by the personal or societal levels of motivation to comply with the related individual or group (Axelrod, 1986). For example, an individual might believe it is extremely likely that one's manager would approve of him practicing food safety behavior, but only somewhat likely that his friends would approve of the same practice. If the motivation to comply with one's friends is higher than the motivation to comply with their manager, then this individual will only experience a moderate amount of social pressure to perform a food safety behavior (Ajzen, 2005). The subjective norms can be summarized as each important individual believes to the person (nb_i) multiplied by his/her motivation to comply with the behavior (mc_i), that Subjective Norms = $\sum_i nb_i mc_i$. Then the cross products are summarized for all important individuals (Fishbein & Ajzen, 2011).

Control Beliefs and Perceived Behavioral Control

A control belief is defined as a person's estimation of the likelihood that a given facilitating or inhibiting factor will be present (Ajzen, 1991). For example, one might believe that it is implausible that he/she will have enough time to wash his/her hands. At the same time,

that person might be extremely confident that he/she has the necessary hand washing skills. Each control belief contributes to perceived control, or a sense of self-efficacy, in direct proportion to the perceived power of the factor to facilitate or impede the performance of the behavior (Ajzen, 1991, 2005). For example, despite a high competence of one's hand washing skills, time pressures at work may exercise more power to hamper handwashing behavior, thereby reducing perceived control over the behavior.

Perceived control, as described previously, is one's perceived amount of control over behavioral performance, determined by one's perception of the degree to which various environmental factors make it easy versus challenging to carry out the behavior (Fishbein & Ajzen, 2011). For example, "Whether or not I engage in food safety practices in the next week is under my control", "It is up to me whether or not I engage in food safety practices in the next week." In contrast, self-efficacy is one's degree of confidence in the ability to perform the behavior in front of various obstacles or challenges. Self-efficacy is measured by having respondents rate their behavioral confidence on bipolar "certain I could not – certain I could" scales (Fishbein & Ajzen, 2011). For example, "If I wanted to, I am confident that I could engage in food safety practices in the next week," "For me, to engage in food safety practices in the next week would be easy"(Lin & Roberts, 2017). Although only a few studies have discussed the similarities and differences between these two constructs (Ajzen, 1991; Fishbein & Ajzen, 2011), the researcher suggests the utility of including both measures.

The perceived control itself can be traced to a set of underlying beliefs that deals with the presence or absence of necessary resources and opportunities (Ajzen, 1991; Lin & Roberts, 2017). These control beliefs or self-efficacy may also be based on past experiences with the behavior, but are often influenced by the experiences of peers and friends (or social norm), and

by other factors that increase or reduce the perceived difficulty of performing the behavior (Axelrod, 1986; Fishbein & Ajzen, 2011). The more resources and opportunities individuals believe they possess, and the fewer obstacles or impediments they anticipate, the greater their perceived control over the behavior (Ajzen, 1991). To estimate the perceived behavioral control, each control belief (cb_i) or self-efficacy (se_i) is multiplied by the perceived power of the control factor (pp_i), and then the perceived control is a summation of the cross products, illustrated as $PBC = \sum_i cb_i pp_i$ or $PBC = \sum_i se_i pp_i$ (Fishbein & Ajzen, 2011).

Behavioral Intention and Prediction of Food Safety Behaviors

TPB asserts that the most important determinant of behavior is the behavioral intention (BI). The TPB has constructed the behavioral intention as an immediate antecedent of behavior and an indication of an individual's readiness to perform a given behavior. It is based on the summation of a person's attitude toward the behavior, subjective norms, and perceived behavioral control, illustrated as $BI = \sum_i Attitude_i SN_i PBC_i$ (Fishbein & Ajzen, 2011). Although, the TPB has been used extensively in health belief and health behavior research to uncover beliefs, other researchers have also used these beliefs to implement interventions within the foodservice environment (Godin & Kok, 1996; York et al., 2009). Once these primary beliefs have been identified, they can be targeted for change.

Intentions capture both the level of the set goal or behavior (e.g., the number of hours that the foodservice workers intend to spend training on food safety behaviors) and the person's level of commitment (e.g., how determined they are to devote that number of hours to train or practice food safety behaviors). Although the most behavior is habitual or involves responses that are triggered automatically by situational cues (e.g., Wood & Neal, 2007), forming intentions can be

crucial for securing long-term goals (Baumeister & Bargh, 2014; Quirin, Kuhl & Dusing, 2011). The concept of intention has thus been invaluable for researchers concerned with behavior change, and interventions designed to promote public health, food safety behaviors, and educational and organizational outcomes generally rely on a framework that utilizes intentions as a critical determinant of actions (e.g., Locke & Latham, 1992; Quirin, Kuhl & Dusing, 2011). Foodborne illnesses remain prevalent because the problem lies in the intention and behavioral gap.

A meta-analysis of 185 independent studies published up until the end of 1997 noted that the TPB accounted for 27% and 39% of the variance in behavior and intention, respectively. When behavior measures were self-reported, the TPB accounted for 11% more of the variance in behavior than when behavior measures were objective or observed ($R^2 = .31$ and $.21$, respectively; Armitage & Conner, 2001). Various correlational studies indicate that intentions predict behavior (Sheeran, 2002). Moreover, intention offers a superior prediction of behavior in correlational tests compared to other cognitions including explicit and implicit attitudes, norms, self-efficacy, perceptions of risk and severity (Sheeran, Harris, & Epton, 2014) and personality factors (Chiaburu et al., 2011).

Therefore, it is vital to change intention to perform a behavior in order to change existing behavior or initiate a new behavior (Rhodes & Dickau, 2012; Webb & Sheeran, 2006). Previous meta-analyses (Armitage & Conner, 2001; McEachan, Conner, Taylor, & Lawton, 2011; Webb & Sheeran, 2006) have supported the general validity and utility of the TPB in changing a range of health behaviors. Then, the TPB is popular and parsimonious because of its clearly operationalized guidelines and measures (Ajzen, 2005; Conner & Norman, 2005; French & Hankins, 2003), theoretical related analytical procedures (Hankins, French, & Horne, 2000), and

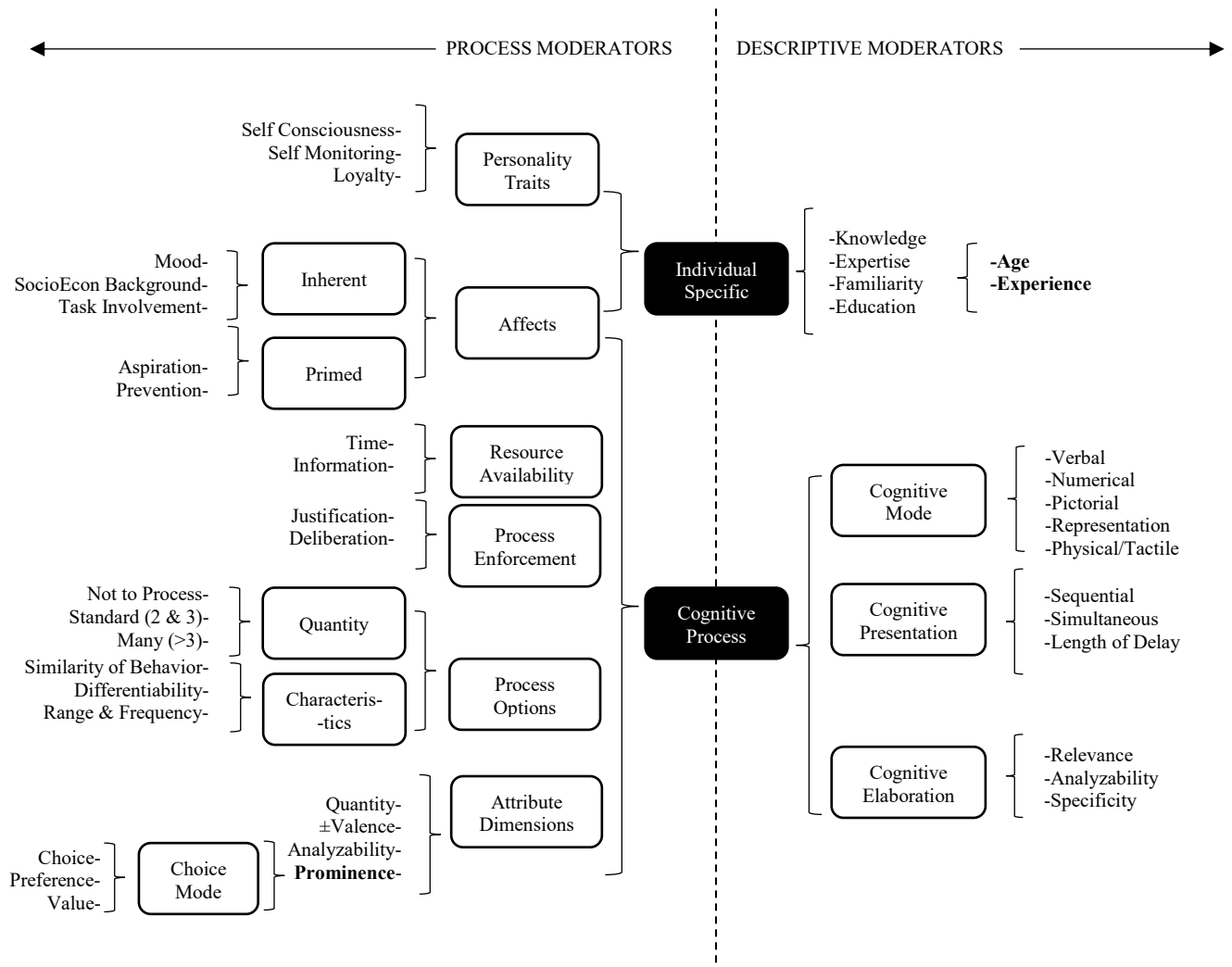
guidelines to develop TPB based interventions (Sutton, 2002). The TPB is considered particularly useful in applied settings, due to its robustness in moderating the impacts among different behavior types, heterogeneity in samples (e.g., age groups), and methodological design (e.g., longitudinal follow-up and nature of measurement) (Sheeran, Klein, & Rothman, 2016).

The Theory of Planned Behavior Moderators

Two commonly reported types of moderators impact the strength of the TPB antecedents and behavioral intention relationships: those that create descriptive variance and those that create procedural variance (Conner & Godin, 2007; Conner & Norman, 2005). Moderators that create descriptive variance do so by changing the value, meaning, and/or weighting of the information provided. Moderators that create procedural variance do so by affecting the decision-making processes, strategies, and goals. Figure 2.3 diagrams and briefly categorizes the potential moderating relationships discussed in the literature.

Sheeran et al. (2017) found that *experience* can produce a quadratic relationship between intentions and behavior, therefore can be an important moderating variable. However, this quadratic relationship and the moderator information remains unknown within the foodservice literature (Sniehotta, Presseau & Araujo-Soares, 2014). Given this, *work experience* and *age* were also be considered as the important moderator variables in the meta-analyses. Another moderator *gender* might potentially impact employees' cognitive process (Harmon-Jones & Mills, 1999; Harris et al., 2009).

Figure 2.3. Potential TPB Moderators Related to Food Safety Cognitive Process with Individual Specifics



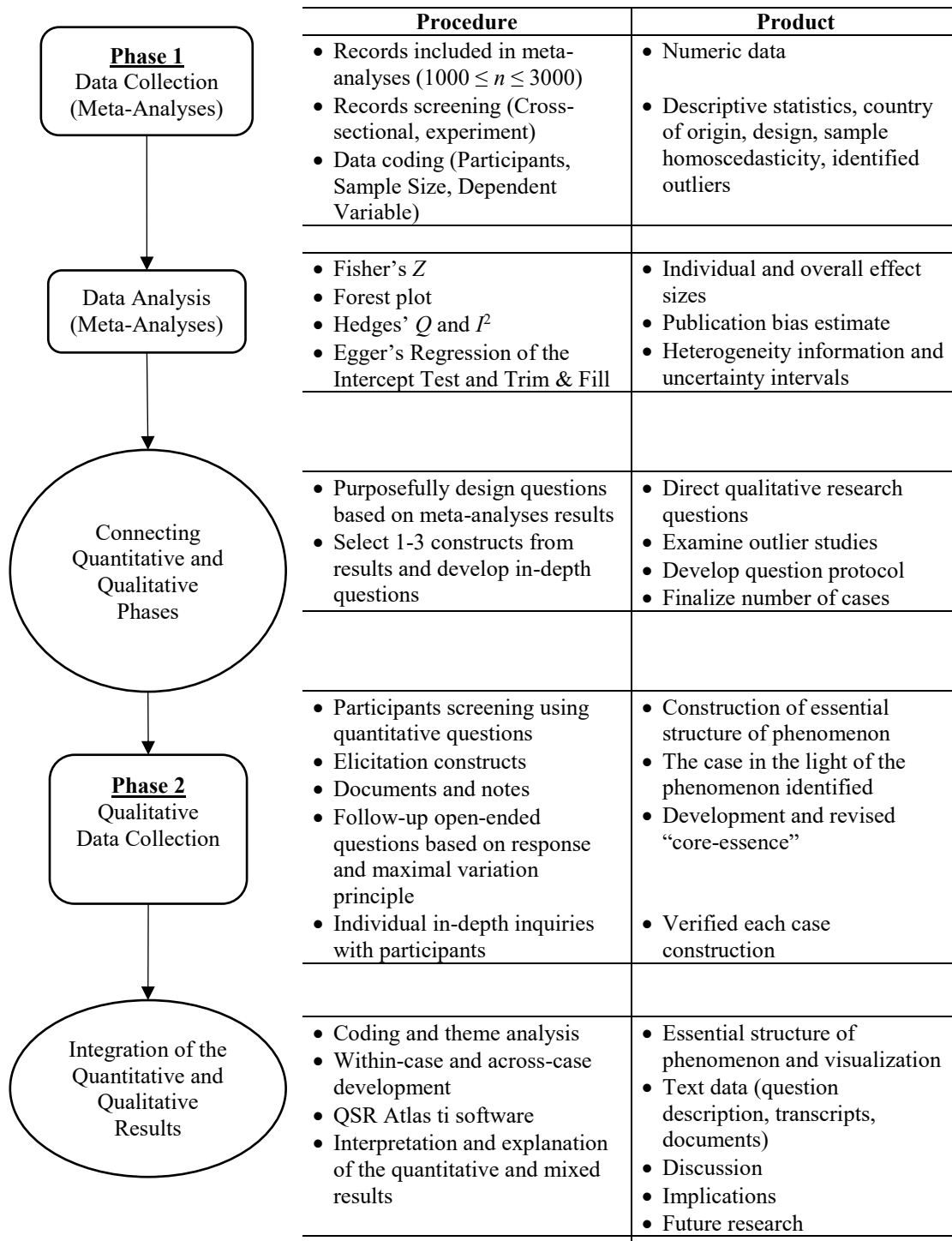
Chapter 3 - Methodology

This project help achieves the explanatory goal by first conducting a systematic review and meta-analyses (Phase 1) with existing literature to better quantify the statistical power and summarize the effect sizes with conflicting studies. Then, in-depth qualitative data (Phase 2) were collected to help explain the statistical results (Song, Sandelowski, & Happ, 2010). Using existing observed cognitive variables, grounded by the Theory of Planned Behavior, the key idea is that our qualitative inquires builds directly on the quantitative results (Creswell, 2014). Thus, the two studies can be properly integrated. Thus, the syntheses of results between the two parts of this study can help explain unobserved heterogeneity information, which is not necessarily preconceived by the investigator from existing cognitive behavioral theories. The purpose of this chapter is to clarify the procedures that were utilized to collect qualitative and quantitative data and provide explicit analytical planning for the integration of the study results.

Integration of Both Quantitative and Qualitative Study

The philosophical assumption behind this study is grounded in the fact that neither quantitative nor qualitative methods are sufficient, by themselves, to capture the detail of a particular behavior (Creswell, 2014). When used in combination, quantitative and qualitative methods can complement each other by taking advantage of the strengths of each (Green & Caracelli, 1997; Miles & Huberman, 1994; Tashakkori & Teddlie, 1998). Using both inductively deriving and deductive reasoning, rich theoretical understandings can be achieved from the data (Creswell, 2014; Song et al., 2010). The detailed integration of study results is explained in Figure 3.1.

Figure 3.1. Elucidation of Mixed Design Results and Point of Integration



The explanatory sequential mixed methods approach is a design that appeals to individuals with a strong quantitative background or from fields relatively new to qualitative approaches (Creswell, 2014, pg 209). The fundamental idea is that the qualitative data collection builds directly on the quantitative results. The mixed method approach is defined as the inquiry involving both quantitative and qualitative data collection, integrating the two forms of data, and using clear philosophical assumptions and theoretical frameworks to understand the interpretation (Creswell, 2014; Song et al., 2010). Within social and health sciences, researchers have utilized mixed methods as a procedure for collecting, analyzing, and “mixing” both quantitative and qualitative data at some stage of the research to gain a better understanding of the research problem (Creswell 2005; Tashakkori & Teddlie, 1998).

Procedures

Phase 1 - Meta-Analyses Procedures

Meta-analysis methodologies have been developed and matured in recent years, advanced to correct biases and summarized the scientific evidence from the literature (Borenstein et al., 2009; Cooper et al., 2009; Hedges & Vevea, 1998). The term meta-analysis is derived from the Greek “meta” or “after” analysis, representing a form of summing up after obtaining the results (Barza, Trikalinos, & Lau, 2009). In systematic reviews, researchers collate empirical evidence that fits the prespecified inclusion criteria to answer a specific research question (Cooper et al., 2009). Meta-analysis is the statistical combination and summarizing of results from multiple studies (Borenstein et al., 2009).

The meta-analysis approach addresses three central questions (Noble, 2006). First, is there support in the sampled population of studies that the relationships make a statistically

significant difference in the outcomes? Second, if the relationships are significant, how large is the effect? In addition to these questions, heterogeneity of results among the primary studies can be evaluated (Sutton, Abrams, & Jones, 2001). Finally, moderate relationships within the context of antecedents-intention relationships can be examined in a corporate and summarizing matter from multiple studies.

A systematic review is useful by analyzing existing power and precision, meanwhile quantifying effect sizes and uncertainty (Deeks, Altman, & Bradburn, 2008). By detecting effects as statistically significant and narrowing down the existing confidence intervals from empirical studies, researchers can identify how the statistical power or exact efficiency are identified through pooling all studies (Totton et al., 2012). Thus, allows factors that differ across studies to be combined, which by using cumulative effect sizes, researchers can answer questions not posed by the individual studies, thus help settle controversies arising from conflicting study results and help identifies future research gaps and research topics (Deeks et al., 2008; Sutton, 2001). Additionally, the benefit of meta-analysis is that by controlling the problem of sampling and study variation by quantifying between-study variations, researchers can statistically assess homogeneity and heterogeneity of the results by using plotted visualizations (Deeks et al., 2008). Thus, comparative evidence can be examined to help boost interpretation to the problem, thus help conclude best practices and solve controversies.

In the context of food safety, meta-analyses have only recently been used to integrate and synthesize food safety information (Deeks et al., 2008; Frewer et al., 2016; Medeiros et al., 2011; Soon et al., 2012). However, most studies focus on outcome effects and mean differences within interventions. Few studies focus on predictive cognitive relationships and heterogeneity information to improve existing cognitive theory and understanding of food safety behaviors

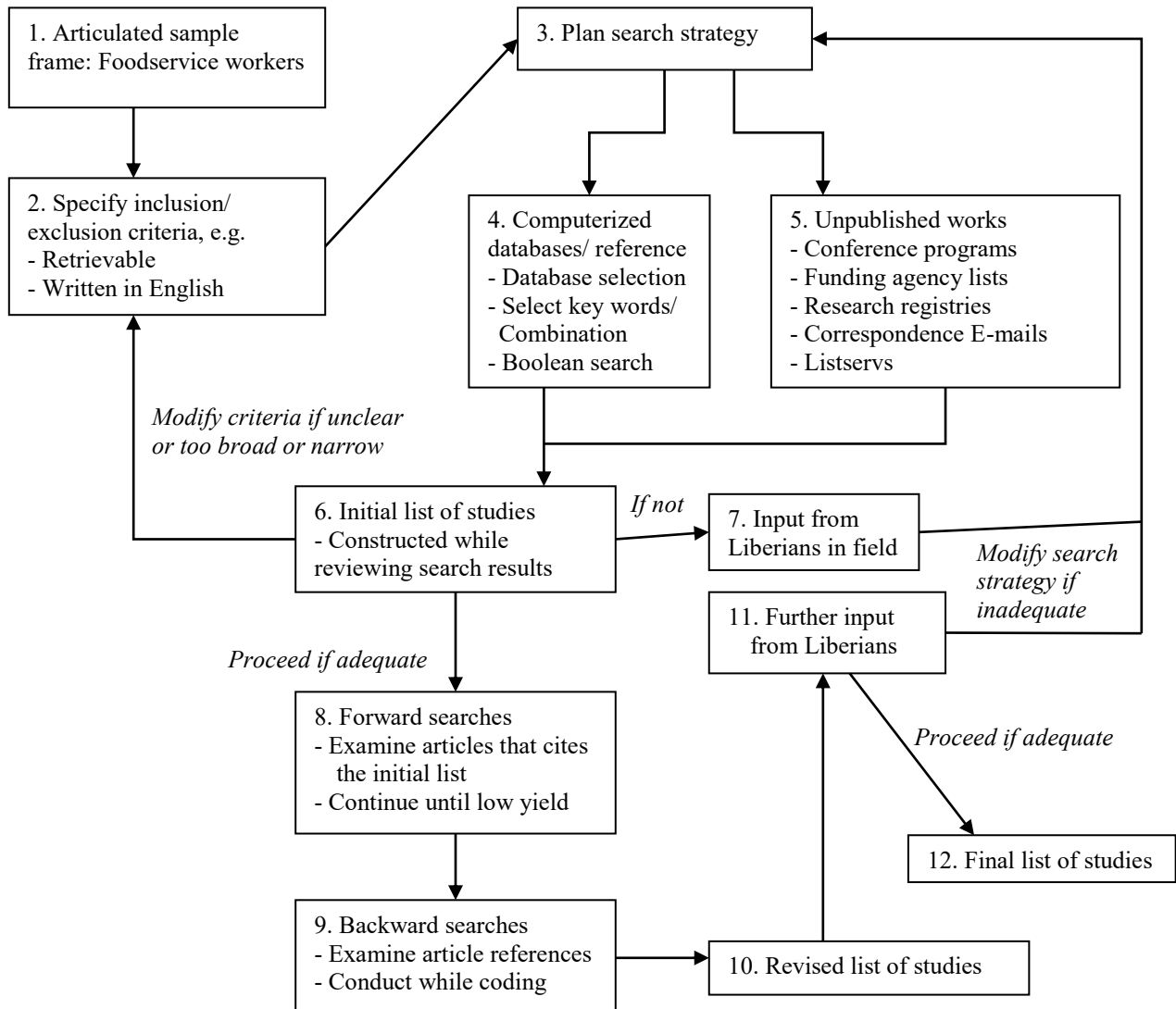
within its content area. Therefore, the specific research purpose of meta-analyses (Phase I) helps summarize conflicting information from different studies, identify unobserved heterogeneity for future investigations, and generate new hypotheses based on collective justifiable evidence.

To determine the evidence base of TPB variables (attitude, subjective norms, and perceived control) to behavioral outcomes of foodservice workers, a systematic search of all published and unpublished cross-sectional and experimental studies are needed. Before relevant studies were collected, a detailed search strategy for observational studies were developed using the following methods: (a) electronic databases (relevant to business management, nutrition and dietetics, public health and workplace safety, and food science) was identified and peer reviewed by senior librarians; (b) reference lists of included articles and previous review articles were manually searched; (c) authors of published articles were contacted to request any unpublished results; (d) relevant high-impact journals related with food safety behavior were manually searched; and (e) a highly sensitive search strategy was developed and peer reviewed by at least two experienced librarians. The detailed development of the search strategy can be found in Figure 3.2 below.

Selection of Studies

The following keywords were used when formulating the search strategy in the electronic databases: ‘theory of planned behavior,’ or ‘theory of reasoned action,’ ‘behavioral intent*,’ and ‘food safety behavior.’ The following Boolean phase search “(((“TPB” OR “theory of planned behavior” OR “planned behavior” OR “theory of reasoned action” OR “reasoned action” OR “TRA”))) AND food *near-10 safety” was used in the main databases and the Boolean operator has been adapted and peer-reviewed independently by two indexing librarians.

Figure 3.2. Development of Highly Sensitive Searching Strategy.



Additionally, ancestral searches was conducted by screening the reference list of both included studies and excluded reviews to identify studies that may have been missed in previous searches. Previous reviews were used as additional references to identify early studies.

In addition to online database searches, manual reviews were conducted on the reference lists of the following lead journals with the most food safety behavior publications between June 1982 and March 2018.

- *Journal of Food Protection*
- *Food Protection Trends*
- *Journal of Food Science*
- *Trends in Food Science and Technology*
- *Food Control*
- *Journal of the Academy of Nutrition and Dietetics*

Additionally, authors of previously published studies were contacted and any unpublished data or studies were requested.

Inclusion and Exclusion Criteria

After, the initial pool of studies has been identified by the search strategies. The title, abstract, and content of the study were evaluated using the following inclusion and exclusion criteria:

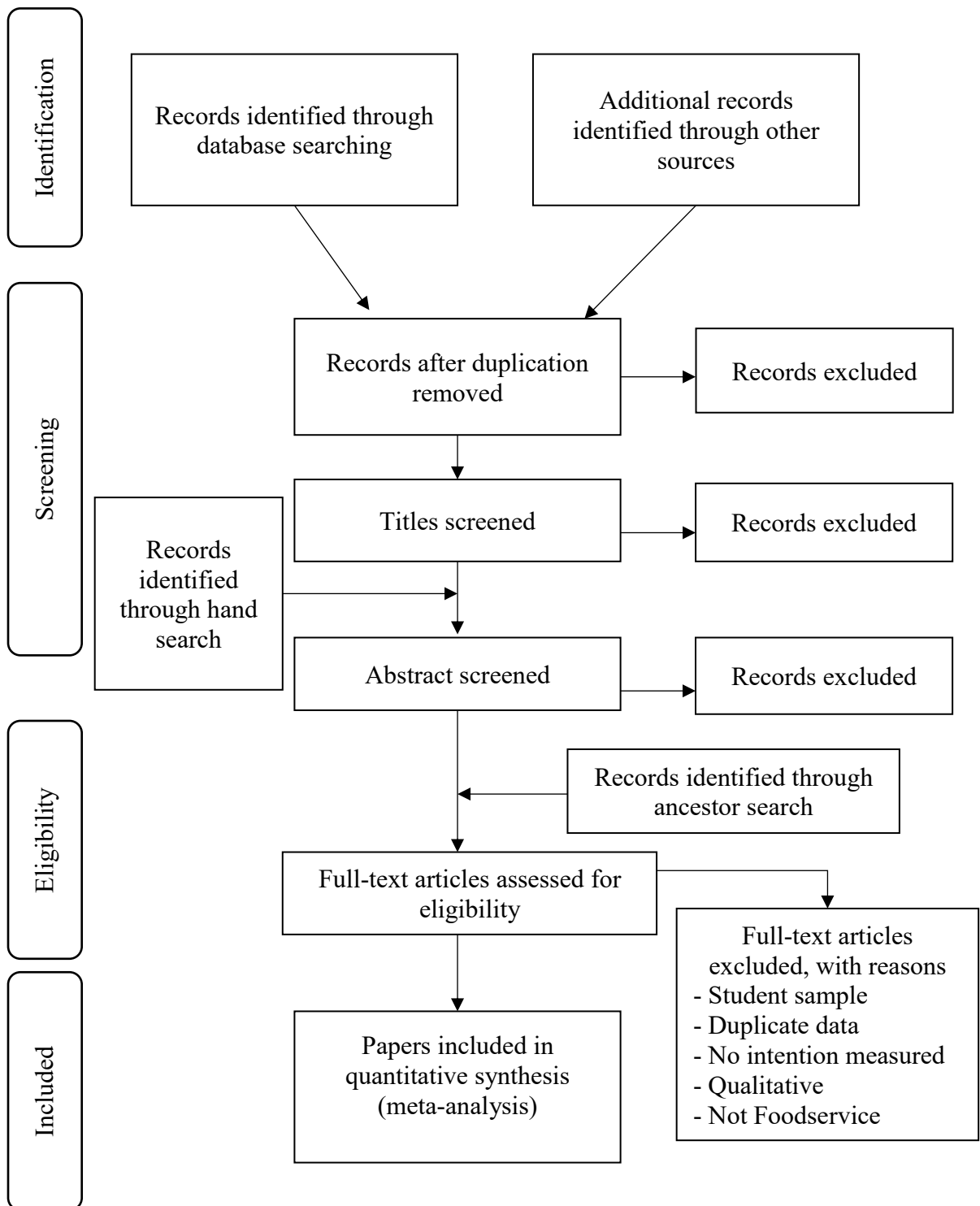
1. Studies must include intentions to perform food safety behaviors with foodservice workers as the population of interest. The ‘foodservice worker’ is defined as the individual who prepared or handled food for others to consume either in a commercial facility or non-profit institutionalized environment (Byrd-Bredbenner et al., 2008). Thus, food handlers who prepare or handle food for others in events or nursing homes were included in the study. However, parents who prepare food for their kids or other friends were excluded. Additionally, studies reporting consumer intentions to adhere to food safety behaviors were excluded (Wheatley, Schaffner, Bruhn, & Blalock, 2008). According to Abbot et al. (2008) and Byrd-Bredbenner et al. (2008), studies using college students or high school

students as future foodservice workers have generic limitations thus were also be excluded.

2. All studies included must report results in English.
3. Studies must report at least one direct measure of attitude, subjective norms, and perceived control (or perceived behavioral control) to be included. Review papers (e.g., Soon, et al., 2012; Viator et al., 2015) or other studies that investigate only background factors or demographic factors were excluded (Ball, Wilcock, & Aung, 2010).
4. A bivariate statistical relationship between the TPB constructs and intention must be retrievable from the results, either from the article itself or upon request from the author(s).

After the initial screening, the inclusion and exclusion procedures were further evaluated by an independent reviewer, and the differences in the inclusion and exclusion process were resolved by discussion. When necessary data is missing, the researcher contacted the corresponding author of the primary studies to obtain additional information about the correlation coefficients and measures used. An example of the generic search framework for food safety behavior-related topics and inclusion and exclusion procedures is listed in Figure 3.3 below.

Figure 3.3. An Example of the Generic Search Framework for Food Safety Behaviors Related Topics and Inclusion and Exclusion Procedures.



Coding Procedure

Studies meeting the inclusion criteria were coded according to the standards outlined by the American Psychology Association (APA; 2011) journal article and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2009 standard (Liberati et al., 2009; See Table 3.1). Additional food safety behavioral intention study specific descriptors are also included in the coding process, which includes details of study methods and the description of behavioral intention.

As noted in the literature review, some studies assessed perceived control utilized direct measurement, whereas other studies included separate measures of perceived control and self-efficacy. As a result, items used to measure perceived control in each study were coded. Based on these coding, measures were be categorized as a ‘direct’ measure of perceived control (i.e., only containing perceived control items), a ‘direct’ measure of self-efficacy (i.e., only containing self-efficacy items) or a ‘mixed’ measure of perceived control (i.e., containing perceived control and self-efficacy items). The data then be extracted and coded by the researcher, and later validated by an independent reviewer (Liberati et al., 2009).

Table 3.1. Data Extraction and Coding Guidelines

APA Journal Article and Meta-Analytic Reporting Standards	Food Safety Behavioral Intention Study-Specific Descriptors
<i>Descriptive Information</i>	<i>Study Descriptors -Behavioral Intention (BI)</i>
1. Study authors	1. Number of antecedents to form BI
2. Year of publication	2. What format was the BI presented: quantitative/ text description/ or visually in a graph.
3. Intended (starting), and actual sample size	3. The scale (max/min) of the attribute dimensions
4. Whether stimulus material was presented in randomized order	4. The scale units of the attribute dimensions
5. What format were choice scenarios presented (online, mail, or paper/pen)	5. What food safety behavior was the participant asked to do?
6. Which statistical test(s) were employed	6. Attitude, Subjective Norms, and Perceived Control values
<i>Study Descriptors – Participant Characteristics</i>	<i>Study Descriptors - Method</i>
7. Recruitment country	8. Did the control variable used?
8. Adult participant population (race, marital, education, employment)	9. Number of behavioral scenarios tested per participant.
9. Compensation method	10. Were other manipulations or intervention used?

Quality of Included Studies

Evaluation of study quality can be highly controversial in systematic reviews and meta-analyses, as quality can be defined in many ways (Valentine & Cooper, 2008). At a broad level, high quality means high correspondence between methods and desired inferences. At a micro-level, quality is considered in terms of study validity, specifically internal, external, construct,

and statistical conclusion validity (Shadish et al., 2014). However, most social scientists agree that the correspondence between methods and inferences should be the primary criterion, if not the only criterion (Valentine & Cooper, 2008). However, researchers' predisposition about the outcome of studies can have a strong impact on how studies are evaluated. Therefore, it is argued that (a) some of the exceptional conditions (e.g., conceptual unidimensionality or empirically observed substantial formative indicators within model) in which attempting to combine into the conceptually overall effect size can be problematic, and (b) multidimensional and empirically uncorrelated (or modestly correlated) indicators within formative model can be difficult to code, as it is empirically different from reflective indicators. Therefore, this study did not code study quality. Instead, the various aspects of research design that are potentially important within the food safety field were coded and evaluated as multiple control variables or moderators of the effect sizes among included studies.

Phase 1 - Statistical Analyses

The statistical analyses of this meta-analysis was following PRISMA 2009 standard (Liberati et al., 2009). Comprehensive Meta-Analysis Version 3.0 (Englewood NJ: Biostat Inc.) was used to document the sample weighted average correlations (r^+) based on a random effects model. The primary metric for the calculation of effect sizes is Fisher's Z , which examines the size of the correlation between TPB direct measurement variables to behavioral intention. Fisher's Z allow collective aggregation of study effects. Forest plots were used to provide a graphical representation of the relative strength of correlations included for each TPB direct relationships.

Definition of Effect Sizes

The effect size refers to the degree to which the hypothetical phenomenon (i.e., increase in attitudes cause an increase in intention) is present in the population (i.e., foodservice employees). Because the data compiled in this review were from various studies conducted under different settings, a random effects model was used in the meta-analyses studies (Lau, Ioannidis, & Schmid, 1998). The random effects model assumes that true effect size might differ from study to study (Lau, Ioannidis, & Schmid, 1998). For example, the effect size might be higher (or lower) in studies where the participants are older, or more educated, or healthier than in other studies, or when a more intensive variant of intervention is used. The term “random” reflects the fact that the studies included in the analysis are assumed to be a random sample of all possible studies that meet the inclusion criteria for the review (Borenstein et al., 2009). The plural (effects) reflects working with multiple true effects (Deeks, Altman, & Bradburn, 2008). The effect size also represents a sample from a larger population of possible studies (Fleiss, 1993).

Calculation of Effect Sizes

The Pearson correlation (Person, 1901), commonly represented as r , represents the association between two continuous variables. With variants existing for other forms, such as r_{pb} when one variable is dichotomous, and the other is continuous, ϕ when both are dichotomous. The formula for computing r (the sample estimate of the population correlation, ρ) within a primary data set is as follows:

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{(N - 1)s_x s_y} = \frac{\sum z_x z_y}{N} \quad (1)$$

- x_i and y_i are scores of individuals i on the two variables.
- \bar{x} and \bar{y} are the sample means of the two variables.
- N is the sample size.
- s_x and s_y are the population estimated standard deviations of the two variables.
- Z_X and Z_Y are standardized scores, computed as $Z_X = \frac{(x_i - \bar{x})}{s_x}$.

To aid the interpretation of r in this meta-analysis, Cohen's (1992) suggestions of $r = \pm 0.10$ representing small effect sizes, $r = \pm 0.30$ representing medium effect sizes, and $r = \pm 0.50$ representing large effect sizes were followed. Conversely, the typical magnitudes of correlations found likely to differ across areas of study, and was not be used as formal guidelines to all behavioral areas (Borenstein et al., 2009). In general, Pearson's r represents a useful, readily interpretable index of effect size for associations between two continuous variables (Field, 2009).

In terms of meta-analysis, r is transformed before effect sizes are combined or compared across studies (for discussion see Hall & Brannick, 2002; Schmidt & Hunter, 2004). This is done because the distribution of the samples' Pearson correlation around a given population ρ is skewed (except in sample sizes larger than those commonly seen in the food safety research, for e.g., big data), whereas a sample of Fisher's transformation of r around a population is symmetric (Hedges & Olkin, 1985, pp. 226–228). This symmetry is desirable when combining and comparing effect sizes across studies. A desirable feature of Z_r in this study is that its standard error depends only on sample size (as standard errors of some other studies also depend

on the effect sizes themselves; Fisher, 1992). In this study, Fisher's transformation of r , denoted as Z_r , is used as shown in Equation (2) (Fisher, 1992) below:

$$Z_r = \frac{1}{2 \ln \left(\frac{1+r}{1-r} \right)} \quad (2)$$

- Z_r is Fisher's transformation of r .
- r is the correlation coefficient.

However, Z_r becomes less desirable because it is not bounded (can have values greater than ± 1.0) and because it is unfamiliar to many researchers (Borenstein et al., 2009). Therefore, this study used Z_r for comparison, then convert Z_r back to r for better interpretation and reporting purposes (Fisher, 1992). The Equation (3) and (4) demonstrated the conversion from Z_r back to r with the standard error of Z_r (Fisher, 1992).

$$r = \frac{e^{2Z_r} - 1}{e^{2Z_r} + 1} \quad (3)$$

- Z_r is Fisher's transformation of r .
- r is the correlation coefficient.

$$SE_{Z_r} = \frac{1}{\sqrt{N - 3}} \quad (4)$$

- N is the sample size of the study.

Computing r from Other Commonly Reported Results

In the ideal case, journal manuscripts would always report the correlation between variables of interest (also actual effect sizes). This can certainly reduce the chances of inaccuracies due to computational errors. However, it is possible that some journal articles included within their study only the t -test value and F -ratio (ANOVA). Therefore, Equation (5) and (6) are used to transfer the results of inferential tests to r (Borenstein et al., 2009):

$$r = \sqrt{\frac{t^2}{t^2 + df}} \quad (5)$$

- t is the reported value of the t -test.
- df is the degrees of freedom of the test ($df = N - 2 = n_1 + n_2 - 2$).

$$r = \sqrt{\frac{F_{(1,df)}}{F_{(1,df)} + df}} \quad (6)$$

- df is the degrees of freedom in the denominator ($N -$ the number of groups), also referred to as the df_{error} .

Estimation of Overall Effect Size

The overall effect size (\overline{ES}) is calculated as a weighted average of the scenario-level effect sizes defined in Equation (2) (Rosenthal, Cooper, & Hedges, 1994). The weights in the weighted average take into account possible intra-study correlation between scenarios (Hedges, Tipton, & Johnson, 2010). Equations (7), (8), and (9) formally define the overall mean effect

size, robust variance estimate, and the weights assigned to each scenario effect size (Hedges et al., 2010):

$$\overline{ES} = \frac{\sum_{j=1}^m \sum_{i=1}^{k_j} w_{ij} ESR_{ij}}{\sum_{j=1}^m \sum_{i=1}^{k_j} w_{ij}} \quad (7)$$

$$V^R = \frac{\sum_{j=1}^m w_j^2 (\overline{ESR}_j - \overline{ES})^2}{(\sum_{j=1}^m w_j)^2} \quad (8)$$

$$w_{ij} = \frac{1}{(V_j + \tau^2) * [1 + (k_j - 1)p]} \quad (9)$$

Where \overline{ES} is the overall weighted average effect size and V^R is the overall robust variance estimate of m number of studies which contain k number of scenarios and:

- ESR_{ij} is the i^{th} scenario effect size of study j ;
- \overline{ESR}_{ij} is the mean effect size for study j
- w_j is the sum of all w_{ij} for a study j (i.e. the total weight of study j)
- w_{ij} is the weight assigned to each choice scenario i belonging to study j
- V_j is the average variance of all scenarios in study j
- τ^2 also called τau^2 is a measure of unexplained between-study variance, and
- p is an unconditional correlation multiplier between estimates.

The magnitude of the overall effect size was calculated relative to the TPB direct measurement constructs to food safety behavioral intention within each included studies. A

direct positive relationship effect is said to exist when Equation (7) is statistically greater than one, and a negative effect exists when the measure is statistically less than one (Hedges et al., 2010).

Data Heterogeneity and Sample Heteroscedasticity

Meta-analysis points out the shortcoming of the null hypothesis of homogeneity versus the alternate hypothesis of heterogeneity (Hedges & Olkin, 1984, p. 123). A significance testing can be used to test whether groups of studies have significantly different average effect sizes using the provided *Fisher's z-index* (Research Question 3). This test of heterogeneity (vs. homogeneity) of effect sizes is frequently evaluated by calculating *Q-test* (or Hedges' *Q-test*). If the *Q* exceeds the critical χ^2 value given the *df* and level of statistical significance chosen (i.e., $p = 0.05$), then it is concluded that the overall effect size is heterogeneous. Or the result concluded that the effect sizes are not all estimates of a single population value, but rather multiple population values (Lipsey & Wilson, 2001, p. 116). In this study, it is defined as Q_z , it can also be demonstrated using the formula for Q_z with Equation (10) as follows:

$$Q_z = \sum_{i=1}^k (w_i(ES_i - \overline{ES})^2) = \sum_{i=1}^k (w_i - ES_i^2) - \frac{(\sum_{i=1}^k (w_i ES_i))^2}{\sum_{i=1}^k w_i} \quad (10)$$

$$df = k - 1$$

- w_i is the weight of study i .
- ES_i is the effect size estimate from study i .
- \overline{ES} is the mean effect size across studies.
- k is the number of studies.

The Q -statistic has a chi-square distribution with $k - 1$ degrees of freedom, or, one less than the number of comparisons (Hedges & Olkin, 1984). The meta-analysts refer the obtained value of the total Q statistic, Q_z , to a table of (upper tail) chi-square values (Hedges & Olkin, 1984; Hedges et al., 2010). If the obtained value is greater than the critical value for the upper tail of a chi-square at the chosen level of significance, the meta-analysts reject the hypothesis that the variance in effect sizes was produced by sampling error alone (Deeks et al., 2008; Lipsey & Wilson, 2001).

Report the Study-Level Measure of I^2

It is only partially good to provide Q_z as statistical significant (i.e., $p = 0.05$) (Higgins & Thompson, 2002). First, the test of heterogeneity provides information about the likelihood of results being homogeneous versus heterogeneous but does not tell us the *magnitude* of heterogeneity if it exists. Second, the statistical power of this heterogeneity test needs to be considered. If there is inadequate power, then the interpreting of a nonsignificant result (the null hypothesis) as evidence of homogeneity should be cautious (Higgins & Thompson, 2002).

There is an alternative way to quantify the magnitude of heterogeneity in the I^2 index, which is interpreted as the percentage of variability among effect sizes that exists between studies relative to total variability among effect sizes (Higgins & Thompson, 2002). I^2 tells us what portion of the total variance in the effect sizes is due to variance between the studies. It is the ratio of true heterogeneity to the total variation in observed effects (Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006). It is useful because it is not sensitive to effect size nor the number of studies (Huedo-Medina et al., 2006). The I^2 statistic allow inference about the amount of variance on a relative scale. If I^2 is near zero, then almost all the observed variance is

spurious. By contrast, if I^2 is large, then it would make sense to speculate about reasons for the variance, and possibly further research to try and explain it (Deeks, Altman, & Bradburn, 2008).

Higgins et al. (2003) were the first to provide tentative benchmarks for I^2 , suggesting that values on the order of 25%, 50%, and 75% might be considered as low, moderate, and high, respectively. The Cochrane Collaboration (Deeks, Higgins, & Altman, 2008) also gives a rough guide to when the percentage of study variance may be important. Thus, this study followed Cochrane Collaboration's suggestion that I^2 below 40% might not be important while I^2 above 75% suggest considerable heterogeneity. This statistic, I^2 , is calculated using the following Equation (11) (Huedo-Medina et al., 2006):

$$I^2 = \frac{\hat{\tau}^2}{\hat{\tau}^2 + \sigma^2} = \begin{cases} \frac{Q - (k - 1)}{Q} * 100\% & \text{when } Q > (k - 1) \\ 0 & \text{when } Q \leq (k - 1) \end{cases} \quad (11)$$

- $\hat{\tau}^2$ also called $\tau\hat{a}u^2$ is the estimated between-study variability.
- σ^2 is the within-study variability.
- Q is the statistic computed for significance tests of heterogeneity.
- k is the number of studies.

Confidence Intervals (or uncertainty intervals) for I^2

In order to answer research question two, this study aims higher by presenting the confidence interval around overall estimates of effect and including all subgroups when a moderator of effects is present. This measure of effect also exists for quantifying the percentage of the variance in a set of studies that is due to the studies themselves and not sampling error (Deeks, Higgins, & Altman, 2008). There are several methods for obtaining an interval to

convey uncertainty in L^2 . Since all the indices are based on Q (in relation to df), our study follows the calculation using the following method (Equation 12-17), if $Q > (df + 1)$, compute

$$B = 0.5 * \frac{\ln(Q) - \ln(df)}{\sqrt{2Q} - \sqrt{2 * df - 1}} \quad (12)$$

or if $Q \leq (df + 1)$, then compute

$$B = \sqrt{\frac{1}{2 * (df - 1) * (1 - (\frac{1}{3 * (df - 1)^2}))}} \quad (13)$$

Then the lower and upper limit of the interval:

$$L = exp * (0.5 * \ln\left(\frac{Q}{df}\right) - 1.96 * B) \quad (14)$$

$$U = exp * (0.5 * \ln\left(\frac{Q}{df}\right) + 1.96 * B) \quad (15)$$

Then the 95% confidence intervals may be obtained as

$$LL_{L^2} = \left(\frac{L^2 - 1}{L^2}\right) * 100\% \quad (16)$$

$$UL_{L^2} = \left(\frac{U^2 - 1}{U^2}\right) * 100\% \quad (17)$$

- *df means degrees of freedom.*

- Q is the statistic computed for significance tests of heterogeneity.
- L is the lower limit of the interval = estimate - margin of error.
- U is the upper limit of the interval = estimate + margin of error.
- LL_{I^2} is lower limit of the uncertainty interval.
- UL_{I^2} is upper limit of the uncertainty interval.

Because I^2 does not estimate any underlying quantity, these intervals would be better described as uncertainty intervals rather than confidence intervals. However, this study continues to describe them as confidence intervals because the distinction is not practically important (Deeks et al., 2008). Any value (I^2 , a lower limit or upper limit) that is computed as less than zero is set to zero. If the lower limit of I^2 exceeds zero, then I^2 should be statistically significant. However, since I^2 is based on Q , and the sampling distribution of Q is better known than the sampling distribution of I^2 , the preferred method would be to test Q for significance and use this as the test for I^2 being nonzero (Deeks et al., 2008).

Visualization of Publication Bias and Statistic Control

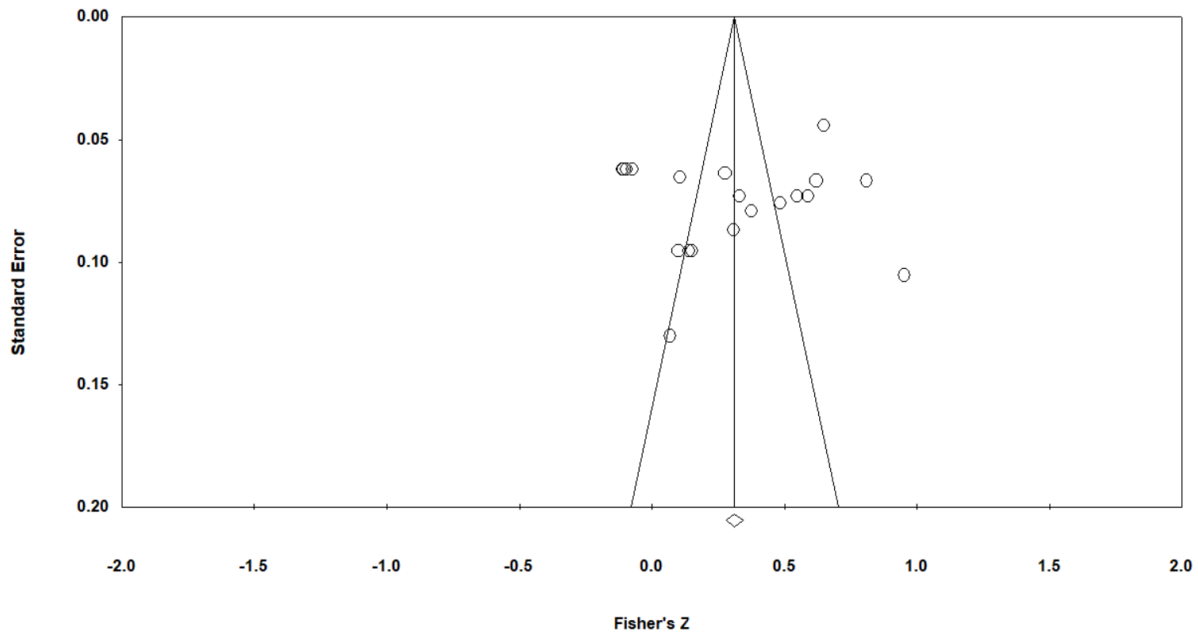
Publication bias or the tendency for journals to publish only positive findings is a significant issue in a meta-analyses, particularly in the social sciences (Liberatti et al., 2009; Shadish et al., 2014). It is recommended that meta-analyses utilize at least two statistical control methods to increase confidence in the findings and control for publication bias (Banks, Kepes, & Banks, 2012). Therefore, publication bias control and statistical analyses of included studies were conducted using Duval and Tweedie's Trim and Fill (T & F) method with funnel plot visualization (Duval & Tweedie, 2000a; 2000b; Duval, 2005) and Egger's Regression of the

Intercept Test for testing significance of the biases (ERI; Egger, Davey Smith, Schneider, & Minder, 1997).

The funnel plots represent a visualized way to evaluate publication bias (Sterne, Becker, & Egger, 2005). Trim & Fill uses a funnel plot of results with effect size on the horizontal axis, and standard error on the vertical axis, to identify hypothetical effect sizes. The funnel plot is a scatterplot of the effect sizes found in studies relative to their sample size, with some variants on this general pattern (Duval, 2005). Evaluation of publication bias using funnel plots involves visually inspecting these plots to ensure symmetry and this general triangular shape. If no bias exists, the funnel plot should be symmetrical. If not, results are added to obtain symmetry, and the effect sizes are recalculated. An example of the Trim & Fill funnel plot can be seen in Figure 3.4.

Extending the logic of funnel plots, a more formal significance test can be conducted using ERI by regressing effect sizes onto sample sizes. ERI predicts the effect size, divided by its standard error, which would be zero if bias is not present (Egger et al., 1997).

Figure 3.4. Example of the Trim and Fill Funnel Plot.



Bias Reporting Standards and Statistical Comparison

Despite the representation of using visualization to help correct for potential publication bias, the Trim & Fill method cannot impute any study values. Thus, it is not the primary reporting method for meta-analyses because the value obtained cannot be compared to another meta-analyses due to the limitation. Therefore, post-hoc Begg and Mazumdar (1994)'s rank correlation test and fail-safe- N (Orwin, 1983) for effect size were conducted as reporting standards for meta-analyses.

A rank correlation test, based on the individual standardized effect sizes and their variances based on Kendall's τ to measure asymmetry (Begg & Mazumdar, 1994). If publication bias is present, the smaller studies will show the larger effects. Failsafe N (also referred to as failsafe numbers) can help us to evaluate the robustness of a meta-analytic finding to the existence of excluded studies. Specifically, the failsafe number is the number of excluded studies, all averaging an effect size of zero, that would have to exist for their inclusion in the

meta-analyses to lower the average effect size to a nonsignificant level (Rosenthal, 1991). A fail-safe number is considered robust if it is greater than $5n + 10$, where n is the original number of studies (Rosenthal, 1991; Rosenthal et al., 1994). Conclusively, the overall publication bias of this study were subjectively assessed using funnel plots and quantitatively assessed using the T&F method and rank correlation test.

Phase 2 – Qualitative Inquirers

Qualitative Theory-Grounded

Theory-Grounded is a philosophical tradition duping *epoché* approach of things dating back to the early years of the twentieth century (Moran 2000, p. 1). Within the tradition, there are different views and emphases, but most generally, Theory-Grounded is a philosophical approach that focuses on phenomena (what we perceive and experience) rather than on the reality of things (what there is). It focuses on the experiences of thinking, perceiving, and encountering the world: how phenomena appear to consciousness (Moran 2000, p. 1). Theory-Grounded examines the encounter between consciousness and the world, then views the latter as inherently human-dependent; as can be seen from its name, it is the *logos* of relating consciousness to *Phenomena* (appearances), rather than to *Pragmata* (things as they are) (Heidegger, 1993).

Edmund Husserl (1970), the founder of Theory-Grounded, suggested that Theory-Grounded was a transcendental science, that is, the study of the conditions of possibility of consciousness. Transcendental Theory-Grounded does not posit phenomenal data as empirical, objectively real, or absolute, but rather as transcendental (Husserl, 1970, 2012a, 2012b). For example, consciousness can be viewed as constrained by the conditions of possibility (Husserl,

2012a, 2012b). Because the data is transcendental, not empirical, the data obtained with Theory-Grounded is fundamentally different compared with psychological experiments. While psychological experiments generate empirical data about different behavioral actions, Theory-Grounded generates transcendental data on the conditions of possibility of behavioral actions (Husserl, 2012a). Thus, space and time can be view as conditions of possibility, without these conditions the experience would become impossible (Husserl, 2012b).

Rationale of Theory-Grounded Approach

Theory-Grounded is primarily a descriptive philosophical method aimed at providing a philosophical description of consciousness and its engagement with the world. As a practice, it has been used in a range of disciplines such as sociology, film studies, anthropology, nursing, musicology, and others (Husserl, 2012b; Merleau-Ponty, 2012). It is particularly useful to describe various aspects of personal experiences (MacKinnon, 1993). By providing a method for discerning and describing human experience, phenomenologists were aspired to discern and describe the implicit “essence” of experience (Husserl, 1970; 2012b). Theory-Grounded is particularly useful for analyzing discrete units of input (e.g., a spoken sentence) and understanding the particular background against which the input is perceived and interpreted (MacKinnon, 1993).

The primary purpose of using Theory-Grounded as the second phase of the project is to study perception, cognition, and other aspects of the mental process in a non-empirical manner. Thus, Theory-Grounded does not seek causal explanations for empirical phenomena. As Theory-Grounded is not a branch of experimental psychology and it does not ask, or attempt to answer, questions about causality (Moran, 2000). However, Theory-Grounded can provide

important insight into to specific mechanisms that give rise to perception, thought, consciousness, or other aspects of experience, this was considered as an essential methodology for neuroscience, cognitive science, and other domains that study human consciousness in an empirical manner (Husserl, 1970; 2012b; Moran, 2000).

The first step of the systematic review in the current study served as the formative phase to further explore the usefulness of a TPB guided framework to understand food safety behaviors. Using both a deductive and inductive analysis process, the primary purpose of Phase II of this study utilized theory-grounded research to qualitatively explore the observed and unobserved effect of food safety behaviors. The fundamental idea is that the qualitative inquiry built directly on the meta-analyses results (Creswell, 2014).

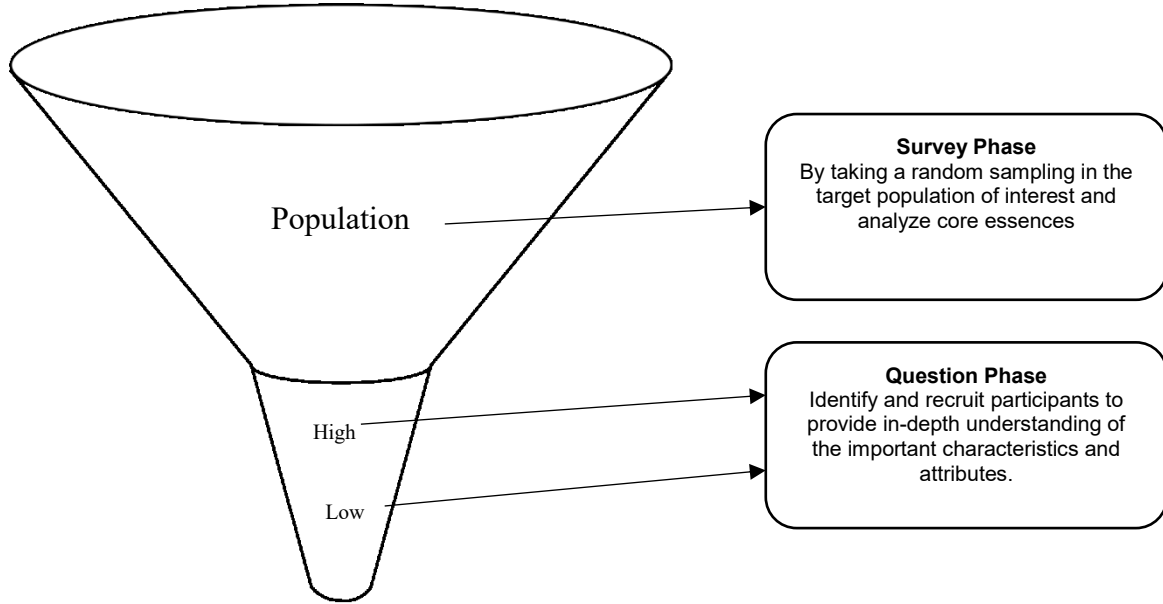
Sampling Strategy

Nesting purposeful sampling strategies (Figure 3.5; Mertens, 2014) were used as recommended by the Mixed Methods International Research Association to increase sampling heterogeneity, thus helping to provide an in-depth understanding of the cognitive process of food safety behavior (Kemper, Stringfield, & Teddlie, 2003; Teddlie & Yu, 2007). This research follows a two-part sampling process, which included both quantitative and qualitative measures (Creswell, 1998). To collect data Crusoe Development Inc., an external marketing company that has panels available for research was utilized. Crusoe sent the Qualtrics-based questionnaire to participants across the United States, and surveys were collected until a minimum of 50 participants responded from both the low and high normative groups (Mertens, 2014).

Answers from quantitative questions in survey phase were recorded and categorized into core essence groups (clusters of meanings). Participants with a high versus low core essence

were funneled into low and high normative groups (to maximum heterogeneity) and were followed-up with in-depth questions.

Figure 3.5. Maximum heterogeneity sampling strategy with key informants



Inquirer’s Procedure and Data Analysis

Project Approval and Human Subject Protection

Before data collection, the study protocols were approved by the Kansas State University Institutional Review Board (IRB # 9234 and # 9234.1). The IRB approval letter was included in Appendix section A.

The Survey Phase

The survey phase was a quantitative descriptive study using semi-structured online scale questions. The principal investigator conducted criterion-based sampling via the online panel using a rigorous screening system for the quality control of the participants.

The criterion for inclusion in the survey phase of this study was based on the responses from the prescreening questions using effective constructs congruent with the results of the meta-analyses. For example, if the meta-analyses found subjective norms to be the most effective construct in promoting behavioral intention, participants were grouped into low versus high subjective norms groups using an established 5-point Likert-type scale to help establish the relevant low versus high criterion.

The Question Phase: In-Depth Open-Ended Questions

The results of the survey phase were categorized into different theme groups, and the core essence of each group was documented as diversity (Fugard & Potts, 2015). After diversity has been established, individuals with strong core essences (clusters of the meaning) are identified as key informants. The key informants were contacted for further in-depth open-ended questions.

The preparation of the standardized open-ended questions helps keep the consistency of each questions and ensure previous time spent in the survey were used. All the respondents were asked a set of key questions, which help to reduce bias. However, during the question phase, the inquirer has to keep a higher degree of “neutrality” to avoid any personal judgment or background, while encouraging the participant with reflective questions and nonjudgmental probes. Detailed method notes were taken during data collection, to allow coding to be more reflexive.

The tentative structural questions are listed below:

Q1. What type of foodservice operation are you working in right now?

a) Quick service restaurant (Fast Food); b) Fast casual restaurant (buffet, ice cream shop, deli); c) Dining hall (school foodservice, government, healthcare); d) Casual dining restaurant (family style); e) Full service restaurant (Fine dining); e) Other, please specify _____

Q2. What roles do you play related to food safety within your organization?

a) Bartenders; b) Cooks; c) Food preparation workers; d) Managers; e) Administration; e) Waiters and waitresses

Q3. What makes the company successful in maintaining food safety programs or practices?

Q4. What unwritten rules do employees have that prevent or encourage proper food safety practices?

Q5. What pressure do the owners, managers, or supervisors exert on you relative to practicing food safety?

Q6. What pressure do your peers or coworkers exert on you relative to practicing food safety?

Q7. What support do owners, managers, supervisors, and peers/coworkers provide that motivates you to practice food safety?

Q8. What barriers do owners, managers, supervisors, and peers/coworkers create that disengage you to practice food safety?

Q9. Do you believe that owners, managers, and supervisors follow proper food safety practices? Please provide some examples.

Q10. Is it important to you that owners, managers, and supervisors follow proper food safety practices? Please explain.

Q11. Do you believe that peers or coworkers follow proper food safety practices? Please provide some examples.

Q12. Is it important to you that other coworkers follow proper food safety practices? Please explain.

Q13. What would you change about food safety practices within your operation?

Q14. What unique approaches have managers within your operation utilized to promote proper food safety practices?

Q15. Choose THREE keywords to describe your experiences regarding food safety.

The Survey Phase: Data Analysis

As previously discussed in the literature review, theory-ground phenomenology founded by Edmund Husserl (1970; 2012b) provided the qualitative principles to guide the analytical process for this study. This study employed an inductive method of descriptive analysis (Creswell, 2014), the diagram analysis (Gibbs, 2008), which are more circular in nature than linear (Arendt et al., 2012; Leiblich et al., 1998). Specifically, the analysis procedure of the survey part of the qualitative inquiries can be summarized in the four-step processes below.

The Four-Step Process (Leiblich & Zilber, 1998):

1. *Familiarization with the data:* This step involves reading and rereading the data to become immersed and intimately familiar with its content.
2. *Coding:* This step involves generating succinct labels that identify important features of the data that be relevant to answering the research question. It involves coding the entire data set and collating all the codes and all relevant data extracts, together for later stages of analysis.
3. *Theme development:* This step involves examining the codes and collated data to identify significant broader patterns of meaning (i.e., potential essences, for example, strong attitudes were identified as theme one). It then develops a detailed analysis of each theme, working

out the scope and focus of each theme, determining the ‘story’ of each. Theme development also involves deciding on an informative name for each theme. The next step helps to collate data relevant to each candidate theme, then analyze the data and evaluate the viability of each candidate theme.

4. *Revision essences*: This step involves checking the candidate essences against the dataset, to determine that essences tell a compelling story of the data and whether they answered the research question or not. In this step, essences are usually refined, which sometimes involves them being split, combined, or discarded.

Data Management

A computer-assisted qualitative data analysis software (CAQDAS), ATLAS.ti v7.5 (Scientific Software Development: Germany) were used to facilitate organization and maintenance of the data. Analyses were begin as soon as data collection has started. Initial codes were labeled and defined by consensus with the second review. Each open-ended questions were reviewed twice. The code list and definitions were developed and refined with the coding of each open-ended question. Theoretical and methodological field notes were also used for analysis (Sandelowski, 2000).

Validity and Triangulation

Validation began as soon as the initial data is collected. The focus on sequential sampling also help validated the accuracy and meaningfulness of the survey phase data by using data from the question phase. The trends and patterns of the initial coding then served as the foundation for generating comparisons and baseline between the survey phase and the question

phase, thus providing a more detailed explanation with triangulation, and help enhance the rigor of the process and credibility of findings.

An audit trail that includes the field notes, survey texts, verbatim transcripts, coding template, data analysis notes, and analytic memos (Birks, Chapman, & Francis, 2008) were developed to establish credibility. The reviewers make refinements using the audit trail, either elaborating or expanding codes or omitting those which did not appear in subsequent questions to ensure that the coding accurately illustrates the data. Additional reviewers, other than the researcher who coded the data, were requested to check and comment on the overall adequacy of the data analysis and coding. Triangulation was established by going through steps of the phenomenology analytical framework independently (Halldórsdóttir, 2000). Theoretical saturation was achieved with circular analysis, repeatedly, until no further qualitative evidence is found (Sandelowski, 2000). Transferability was established with the use of purposeful sampling and a thorough description of the verbatim transcripts and narrative texts (Trochim, 2005). Finally, the writing of the report link concepts to one another and construct the main essential structure of the phenomenon with the data, then help explore cognitive experiences from a neutrality perspective.

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Chapter 4 - Using the Theory of Planned Behavior to Predict Food Safety Behavioral Intention: A Meta-Analysis

Abstract

In the United States, approximately 61% of foodborne illness outbreaks were attributed to a lack of personal hygiene and improper food handling by employees in the foodservice industry. Other reports suggested that 97% of foodborne illness outbreaks can be traced back to food handler errors or human malpractice. Food safety knowledge does not always translate into improved behaviors or attitudes. Thus, previous researchers have encouraged foodservice researchers over the past decade to examine the gaps in food safety knowledge and actual work-related food safety behavior. The purpose of this study is to summarize and evaluate the ability of the Theory of Planned Behavior to predict food safety behavioral intentions.

A total of 1,550 studies were screened with 46 study records meeting the inclusion criteria, including 19 attitude to intention relationships with an average regression weight of 0.271 ($p < 0.01$), 13 subjective norm to intention relationships with an average regression weight of 0.370 ($p < 0.01$), and 14 perceived control to intention relationships with an average regression weight of 0.247 ($p < 0.01$). The overall random effect size (r) was 0.282 ($p < 0.001$) providing collective evidence that the TPB constructs predict food safety behavioral intention. The total between-study heterogeneity ratio, using a random effect model, was low and non-significant ($Q = 1.851, p = 0.396$), which indicates that food safety behavior tends to not be significantly different between different foodservice contents.

Subjective norms were noted as the most robust variable to influence food safety behavioral intention. Studies with employee motivational constructs tend to show the most positive effect on food safety intention relationships. However, the Theory of Planned Behavior

model only explained a combined 22% of total true effect variance. Thus, a considerable amount of the variance (78%) within food safety behavioral intention is still unexplained, leaving considerable room for improvement with future research.

Keywords: Food safety, Behavioral intention, Meta-regression, Heterogeneity ratio

Introduction

In 2015, 902 foodborne outbreaks were reported, resulting in 15,202 illnesses, 950 hospitalizations, and 15 deaths (Center for Control Disease and Prevention [CDC], 2017). To reduce foodborne illnesses, foodservice managers and food handlers must perform essential preventative food safety behaviors. In the United States (U.S.), approximately 61% of foodborne illness outbreaks were attributed to a lack of personal hygiene and improper food handling by employees in the foodservice industry (Angelo, Nisler, Hall, Brown, & Gould, 2017). Other reports suggested that 97% of foodborne illness outbreaks can be traced back to food handler errors or human malpractice (Howes, McEwen, Griffiths, & Harris, 1996; Griffith, Livesey, & Clayton, 2010).

Food safety knowledge does not always translate into improved intentions or behaviors (Debess et al., 2009; Green et al., 2007; Roberts et al., 2008, 2009; Roberts & Barrett, 2009, 2011). Many studies have reported dissonance between knowledge and behavioral intentions (Kwon et al., 2012; Roberts et al., 2008, 2009). Thus, previous researchers have encouraged foodservice researchers over the past decade to examine the gaps in food safety knowledge and actual work-related food safety behavioral intentions (Arendt, Paez, & Strohbehn, 2013; Ong, Frewer, & Chan, 2017; Roberts et al., 2008, 2009).

As previous researchers noted, to help understand of the dissonance between knowledge and behavior, thoroughly integrating previous studies in the context of food safety, is needed (Ong, Frewer, & Chan, 2017; Zanin et al., 2017). A meta-analysis is the statistical combination and summarizing of results from multiple studies (Borenstein et al., 2009). When combined, systematic reviews and meta-analyses can provide collective evidence for the predictivity and heterogeneous discrepancies based on the best available data (Deeks, Altman, & Bradburn, 2008;

Totton et al., 2012). Therefore, the purpose of this study is to summarize and evaluate the ability of the Theory of Planned Behavior (TPB) to predict food safety behavioral intentions.

Specifically, this study examines the size of three direct relationships (attitude to intention, subjective norms to intention, and perceived control to intention) and identifies outlier studies in the context of foodservice management. The second goal of this study is to test the extent of age, gender, and years of work experience as moderating variables that affect the size of the TPB relationships.

Literature Review

The Intention-Behavioral Gap

The intention to behavior gap is large and current evidence suggests that intentions get translated into action approximately 50% of the time (Sheeran & Webb 2016). An analysis of the problem suggests that people striving to enact their intentions must initiate, and maintain, and pursuit to secure the intention realization (Sheeran & Webb 2016). However, behavioral intention still offers a superior prediction of behavior in correlational tests compared to other cognitions, including explicit and implicit attitudes, norms, self-efficacy, perceptions of risk and severity (Sheeran et al., 2014), and personality factors (Chiaburu et al., 2011). Additionally, the authors of a previous meta-analysis synthesized 185 independent health behavioral studies. The TPB accounted for 27% and 39% of the variance in behavior and intention, respectively and was considered the highest predictor compared to other behavioral theories (Armitage & Conner, 2001).

Considering the various theories involving the change of behavioral intention, another meta-analysis (McEachan, Conner, Taylor, & Lawton, 2011) supported the general validity and utility of the TPB (Ajzen, 1991) in a range of behavior types. The TPB is considered popular

and parsimonious due to its clearly operationalized guidelines for measurement (Ajzen, 2005; Conner & Sparks, 2002; French & Hankins, 2003), analysis (Hankins, French, & Horne, 2000), and development of interventions (Sutton et al., 2001). Additionally, the TPB is considered particularly useful in applied settings, due to its robustness in moderating the impacts among different behavior types, heterogeneity in samples (e.g., age groups), and methodological design (e.g., longitudinal follow-up; McEachan et al., 2011).

Various correlational studies also supported that intentions predict behavior (Sheeran, 2002). Thus, using the behavioral intention to predict behavior remains important as to understand the factors related with cognitive behavioral change (Sheeran & Abraham, 2017). Therefore, previous studies suggest it is vital to improve behavioral intention to change existing behavior or initiate new behavior (Rhodes & Dickau, 2012; Webb & Sheeran, 2006).

The Theory of Planned Behavior in Foodservice Management

In the context of the TPB, attitudes toward the behavior, subjective norms, and perception of behavioral control combine to produce intentions that determine the performance of the behavior (Fishbein & Ajzen, 2011). The performance of the behavior is traced respectively to beliefs about the behavior's likely outcomes, beliefs about the expectations of important others, and beliefs about factors that may facilitate or hinder performance of the behavior. The intention is held to be the motivational component that spurs an individual to engage in a particular behavior (Fishbein & Ajzen, 1975). Thus, it is designed to permit prediction and explanation of behavioral achievement by considering motivational antecedents, reflected in intentions, along with other factors under volitional control (Fishbein & Ajzen, 2011).

High-quality systematic reviews are frequently conducted and updated in many industries, such as medicine and aviation, to help establish evidence-based guidelines for employee safety behavior. However, in foodservice management, there is a lack of systematic reviews and meta-analyses, which also causes limitations in the implications for practice (Chapman et al., 2010; Powell, Jacob, & Chapman, 2011).

Food safety behavior is better understood in an environment of work-related content, which could lead to potentially conflicted behavioral actions (Lowe, Norman, & Sheeran, 2017). Conflicting study results with different levels of statistical power has led to considerable difficulty in identifying behavior variance and indicators of risk (Deeks, Altman, & Bradburn, 2008). Thus, a meta-analysis combines study effect sizes and provides high-quality evidence in a holistic fashion, which helps to summarize conflicting study results, identifies influential outliers for future investigations, and generates new hypotheses based on collectively justifiable evidence from multiple studies (Dixon-Woods et al., 2006).

Previous Reviews

A plethora of reviews have assessed the effectiveness of using food safety training and educational interventions to enhance food safety behaviors, both in commercial and institutional foodservice settings. However, there is a lack of reviews related to cognitive process, effective motivators, and contextual variables related to the conformity of safe food handling practices. For example, Campbell et al. (1998) summarized evidence on the effectiveness of public health interventions regarding food safety in restaurants, institutions, homes, and other community-based settings. They concluded that routine inspections (at least once per year) of the foodservice operation is effective in reducing the risk of foodborne illness. The study results

noted food handler training can improve the knowledge and practices of food handlers, and selected community-based education programs can increase public knowledge of food safety. However, limitations have been found with this review, no effect sizes are presented and the review is more than 20 years old.

Egan et al. (2007) summarized food hygiene training studies in the commercial sector. Focused on studies that evaluated the effectiveness of such training. The study focused particularly on the training methodology and effectiveness of the food hygiene training. Again, no effect sizes were presented, and the review was limited to commercial foodservice operations with one type of food safety training. The authors noted the lack of behavioral and cognitive elements reported within the existing food safety literature, but their results related to attitude were not systematically examined or statistically combined.

Medeiros, Cavalli, Salay, and Proenca (2011) conducted a systematic review on methodological strategies used for food safety training programs. Their review screened through 602 studies in multiple languages and included 14 for the final review. Their analysis showed interactive media and hands-on activities tend to be mostly accepted by employees and contributed the most toward the enhancement of employees' skills and knowledge. However, no effect sizes were calculated and the authors only focused on programs that were designed to increase workers' knowledge of important food safety and hygiene procedures with no specific focus on food safety behavioral-based training methods.

Soon, Baines, and Seaman (2012) conducted a meta-analysis, focused on food safety training resulting in improved hand hygiene attitudes. This review hypothesized hand hygiene attitudes as the dependent variable of effective training, which can lead to sustainable handwashing self-reported behavior. However, important cognitive variables, such as subjective

norms, and perceived behavioral control were not included, thus leading to limitations in predicting sustainable behavior. An additional limitation of their review was the lack of any selection criteria that focused on study quality. The study also focused on improving hand hygiene knowledge, thus did not address the knowledge-behavioral gaps in term of food safety behaviors. The primary results also reported a significant amount of heterogeneity within hand hygiene knowledge without identification of the source.

Viator, Blitstein, Brophy, and Fraser (2015), conducted a narrative review of both behavioral and environmental food safety interventions to help develop evidence-based practical guidelines for future food safety education interventions. The authors examined multiple dependent variables from knowledge, attitudes, behavior, and management practices and their influence on foodborne disease rates and outbreaks. The authors evaluated the quality of the studies between 1993 and 2012 conducted in commercial and institutional foodservice settings. The study suggested multiple improvement procedures to help increase the quality of the reporting standards. However, no effect sizes were calculated nor quantifiable suggestions about what effective strategies could be used to enhance food safety behaviors in foodservice domains.

Therefore, the purpose of this study is to summarize and evaluate the ability of the Theory of Planned Behavior (TPB) to predict food safety behavioral intentions. Specifically, this research is concentrated on the following research questions:

RQ₁: Do attitude, subjective norms, and perceived control have a significant random-effect on food safety behavioral intention among foodservice workers?

RQ₂: Do gender, age, and work experience moderate the relationship between attitude and intention, subjective norms and intention, and perceived control and intention?

RQ₃: Are there any influential outliers consider in observed effects between food safety attitude, subjective norms, and perceived control to food safety behavioral intention?

Methodology

Before relevant studies were collected, a detailed search strategy for observational TPB studies was developed and reviewed by three food safety experts. The following keywords were used when formulating the search strategy in the electronic databases: ‘theory of planned behavior’, or ‘theory of reasoned action’, ‘behavioral intent’, or ‘food safety behavior’. The identified keywords were then adapted and transformed to following Boolean phrase search operator: (“TPB” OR “theory of planned behavior” OR “planned behavior” OR “theory of reasoned action” OR “reasoned action” OR “TRA”) AND (“food* near-10 safety”). The transformed operators were then used in the five main databases (ABI/INFORM; Web of ScienceTM; EBSCOhostTM; Dissertations and Theses Global; SCOPUSTM; PubMed) and the overall search procedure was reviewed independently by two indexing research librarians.

Additionally, ancestral searches were conducted by screening the reference lists of both included studies and excluded reviews to identify studies that might have been missed in previous searches. Previous reviews (Campbell et al., 1998; Egan et al., 2007; Medeiros et al., 2011; Soon, et al., 2012; Viator et al., 2015) were used as additional references to identify early studies. In addition to online Boolean phrase searches, manual reviews were conducted on the reference lists of the following lead journals, which include the *Journal of Food Protection*, *Food Protection Trends*, *Journal of Food Science*, *Trends in Food Science and Technology*, *Food Control*, and the *Journal of the Academy of Nutrition and Dietetics*. The manual reviews were conducted with these lead journals dated between June 1982 and March 2018.

Additionally, corresponding authors of the included studies were contacted, and any unpublished data or missing variables were requested via email.

Inclusion and Exclusion Criteria

The initial pool of studies had been identified by the search strategy, the title, abstract, and contents of the study were evaluated using the inclusion and exclusion criteria. The inclusion and exclusion criteria stipulated that studies must: (a) include intentions to perform food safety behaviors; (b) have been conducted with foodservice employees as the population of interest; (c) report results in English; (d) has been published between June 1982 and March 2018; (e) report at least one direct measure of attitude, subjective norms, and perceived control (or perceived behavioral control); and (f) have a retrievable bivariate statistical relationship between the TPB constructs and intention, either within the results of the article itself or upon request from the author(s). Review papers (e.g., Soon, et al., 2012; Viator et al., 2015) or other studies that investigate only background factors or demographic factors were excluded (Ball, Wilcock, & Aung, 2010).

After initial screening, the inclusion and exclusion procedures were further evaluated by an independent researcher, and the differences in the inclusion and exclusion process were resolved by discussion. When necessary data was missing, the researcher contacted the corresponding author of the primary study to obtain additional information about the correlation coefficients and measures used. A visual forest plot was used to identify the generic search framework and excluded studies.

Coding Procedure and Study Quality

Studies meeting the inclusion criteria were coded according to the standards outlined by the American Psychological Association (APA; 2011) and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2009 standards (Liberati et al., 2009). Additional descriptors were included in the coding process. These included: (a) type of foodservice employee; (b) type of food safety behavioral intention, and (c) details of the study methodology.

Evaluation of study quality can be highly controversial in systematic reviews and meta-analyses, as quality can be defined in many ways (Valentine & Cooper, 2008). However, researchers' predisposition about the outcome of studies can have a strong impact on how studies are evaluated. Therefore, this study only coded study quality at a micro-level, in which quality is considered in terms of measurement accuracy and reports of research design (which include demographic profiles).

Two measurement qualities specific to the TPB have been evaluated. According to Fishbein and Ajzen (2011), an elicitation study must be conducted prior to measurement as the qualitative part of the TPB study to identify individual level of behavioral beliefs. Then, the main constructs should be measured using the TACT (Target, Action, Context, and Time; Shadish et al., 2014) elements for improved description of the measurement item and the behavior. The correspondence between methods and desired outcomes was not evaluated. Instead, the various aspects of research design including: study location, sample size, sample character, mean age and demographic profile of the participants, type of survey language used, description of the behavioral intention, and type of the measurement scale were reported as important evaluations for study qualities within foodservice domains.

Data Analysis

Comprehensive Meta-Analysis (Version 3.0) was used to document sample weighted average correlations (r^+) based on a random effects model. The random effects model assumes data being analyzed are drawn from different populations whose differences allow the true effect size to differ from study to study (Borenstein et al., 2009). The random effects model also allows for generalization to a larger population by allowing multiple true effects (Raudenbush, 2009).

After reviewing and coding the selected studies, the primary metric for the calculation of effect size was Fisher's transformation of r , denoted as Z_r , also known as Fisher's Z (Fisher, 1992). Fisher's Z represents the association between two continuous variables. This study used Z_r for comparison, then converted Z_r back to r for better interpretation and reporting purposes (Fisher, 1992). Therefore, the overall effect size (\overline{ES}) were calculated as a weighted average of the scenario-level effect sizes. Specifically, the magnitude of the overall effect size was calculated relative to the TPB direct measurement constructs to behavioral intention within each included study. The weights in the weighted average consider possible intra-study correlation between scenarios (Hedges, Tipton, & Johnson, 2010). A direct positive relationship effect is said to exist when r^+ is statistically greater than one, and a negative effect exists when the measure is statistically less than one (Hedges et al., 2010).

All final results were evaluated following Cohen's (1988) recommendations, where a correlation of $r = 0.10$ represents a small effect size, $r = 0.30$ represents a medium effect size, and $r = 0.50$ represents a large effect size. Forest plots with study precision were used to provide

a graphical representation of the relative strength and weakness of study effect sizes included for each TPB correlation.

Meta-Regressions

Meta-regression was conducted using the effects of moderating variables (mean age, gender, and years of work experience) on the behavioral intention as the dependent outcome. Meta-regression is similar to regression or multiple regression in primary studies in that it analyzes the relationship between moderating variables and a dependent variable. However, in a meta-regression, variables are at the study-level rather than subject-level (Borenstein et al., 2009). Similar to standard regression techniques, R^2 is used to calculate the proportion of the variance that is explained by the moderating variables. A set of multi-meta regressions were conducted with included studies weighted by the reciprocal of the sampling variance (Konstantopoulos, 2013) and using a random-effects, maximum likelihood model. Behavioral intention was chosen as the dependent variable for these analyses because it was the most consistently researched outcome measure of the included studies and the theory. Borenstein et al. (2009) suggested an approximate ratio of 10 dependent variables to 1 predictor variable when performing meta-regressions. The Variance Inflation Factor ($VIF < 10$) was checked to avoid any multicollinearity.

Publication Bias

The tendency for journals to publish only positive findings (publication bias) is a significant issue in a meta-analysis, particularly in the social sciences (Liberatti et al., 2009; Shadish et al., 2014). Therefore, publication bias analyses of included studies were estimated

using sensitivity analyses, which evaluates the robustness and generalizability of study results in relation to potential publication biases. Three of the sensitivity analyses were conducted, Egger's Regression of the Intercept Test (ERI, Egger, Smith, Schneider, & Minder, 1997), Duval and Tweedie's trim and fill method (T&F, Duval & Tweedie, 2000), and Begg and Mazumdar's (1994) rank correlation test. If publication bias is identified by the above methods, additional fail-safe N (Orwin, 1983) for effect size were also reported to indicate how many studies would be required to nullify a significant meta-analytic mean.

Results

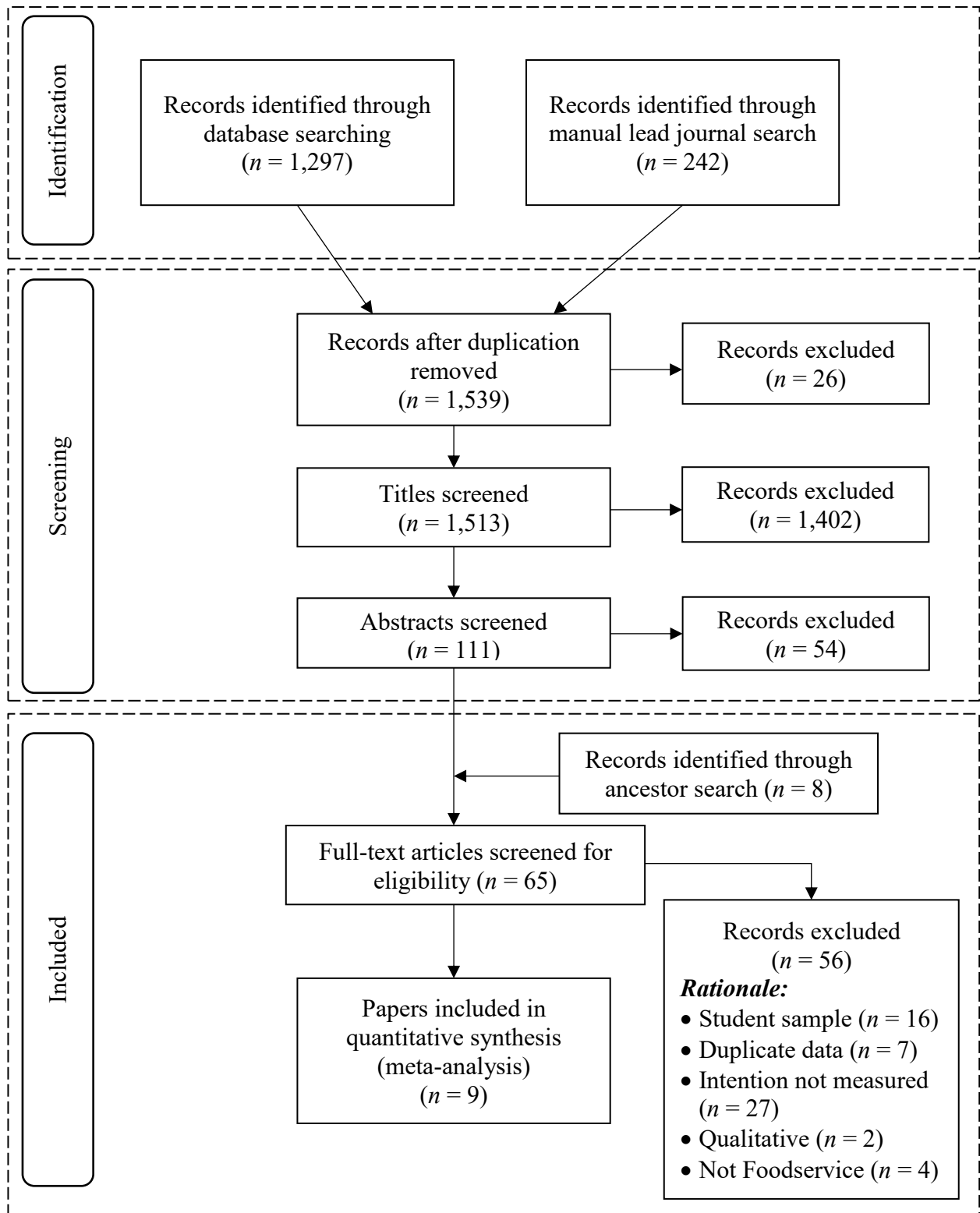
Study Retrieval

The electronic boolean operator search and manual journal search were conducted in March 2018. A total of 1,539 studies were identified and screened for duplication. A flow diagram of the search strategy, including the number of included or excluded studies are presented in Figure 4.1.

Study Characteristics and Coding

The data were extracted and coded by two independent researchers, and later cross-validated at discussion meetings with an intercoder agreement of 100% (Liberati et al., 2009). After coding all included studies, a combination of 46 study relationships were recorded with 19 food safety attitudes to intention correlations, 13 subjective norms to intention correlations, and 14 perceived behavioral control to intention correlations. Study characteristics of included studies are provided in Table 4.1.

Figure 4.1. Flow Diagram for Search Strategy



1 **Table 4.1.** Study Characteristics

Author Names and Year	Place	N^b	Sample Character	Mean Age	Male Ratio	Work Exp. (Yrs)	Language	Design	Independent Variable	Dependent Variable	Measurement	Pilot /TACT (Y/N)
Clayton & Griffith, 2008	UK	113	Food handlers	N/A	N/A	N/A	English	Telephone survey	Attitude toward behavior	Hand hygiene intentions	7-point Likert type (very unlikely/very likely)	N / N
Hinsz et al., 2007	US	162	School meal distributors	40.98	63.0%	8.34	Spanish and English	Paper survey	Attitude toward behavior	Intentions toward avoiding contamination	7-point Likert type (strongly disagree/ strongly agree)	N / N
Lee et al., 2013	US	227	Frontline restaurant employees	30.9	45.1%	1.93	English	Paper survey	Attitude toward behavior	Intentions toward following workplace food safety practices	7-point Likert type (strongly disagree/ strongly agree)	N / N
Liu et al., 2014	US	261	Non-buffet Chinese restaurant employees	N/A	56.7%	6.35	Chinese and English	Paper survey	Attitude toward behavior	Intention to provide food safety training in the future	7-point Likert type (strongly disagree/ strongly agree)	Y / N
Pilling et al., 2008	US	190	Foodservice employees	28.8	68.3%	7.50	English or Spanish	Paper survey	Attitude toward behavior	Intention to perform food safety behaviors	Bi-polar scale (-3 extremely bad/ +3 extremely good)	Y / Y
Roberts & Barrett, 2011	US	236	Restaurant managers	42.17	50.4%	12.81	English	Telephone survey	Attitude toward behavior	Intention to provide food handling training	Bi-polar scale (-3 strongly disagree/ +3 strongly agree)	Y / Y
Seaman & Eves, 2008	UK	135	Food workers at care setting	N/A	N/A	N/A	English	Paper survey	Attitude toward behavior	Intention to conduct safe food handling practices	Bi-polar scale (-3 very unlikely/ +3 very likely)	Y / Y
Seaman & Eves, 2010	UK	249	Food handlers at care setting	N/A	N/A	N/A	English	Paper survey	Attitude toward behavior	Intention to carry out safe food handling practices	Bi-polar scale (-3 definitely untrue/ +3 strongly agree)	Y / Y
Soon & Baines, 2012	UK	62	Fresh produce farm workers	30.8	55%	5.10	English	Paper survey	Attitude toward program intervention	Handwashing intentions	Bi-polar scale (-3 very impractical/ +3 very practical)	N / N

Note: TACT = Target, Action, Content, Time; Ajzen (2002) reconstructed these elements as an acronym and recommended the inclusion of all four elements to make the behavior more specific

Note: Pilot = Pilot/ Elicitation studies are recommended when using the theory of planned behavior (TPB) to establish the cognitive foundation of a population's salient exercise beliefs.

Note: N^a = Starting sample size, N^b = Actual sample size; UK = United Kingdom; US = United States; WorkExp = average years of working experience

2 Most of the studies were conducted in the U.S. with front line food handlers. For
3 measurement quality control, most of the studies did not follow the Target, Action, Context,
4 Time statement and didn't conduct elicitation studies before the construct measurement, which is
5 recommended in the TPB literature (Fishbein & Ajzen, 2011). All of the studies reported
6 internal validity using Cronbach's alpha, and most of the studies established construct validity by
7 matching the assessment of the attitude, subjective norms, and perceived behavioral control with
8 the intended food safety behavior (Shadish et al., 2014).

9

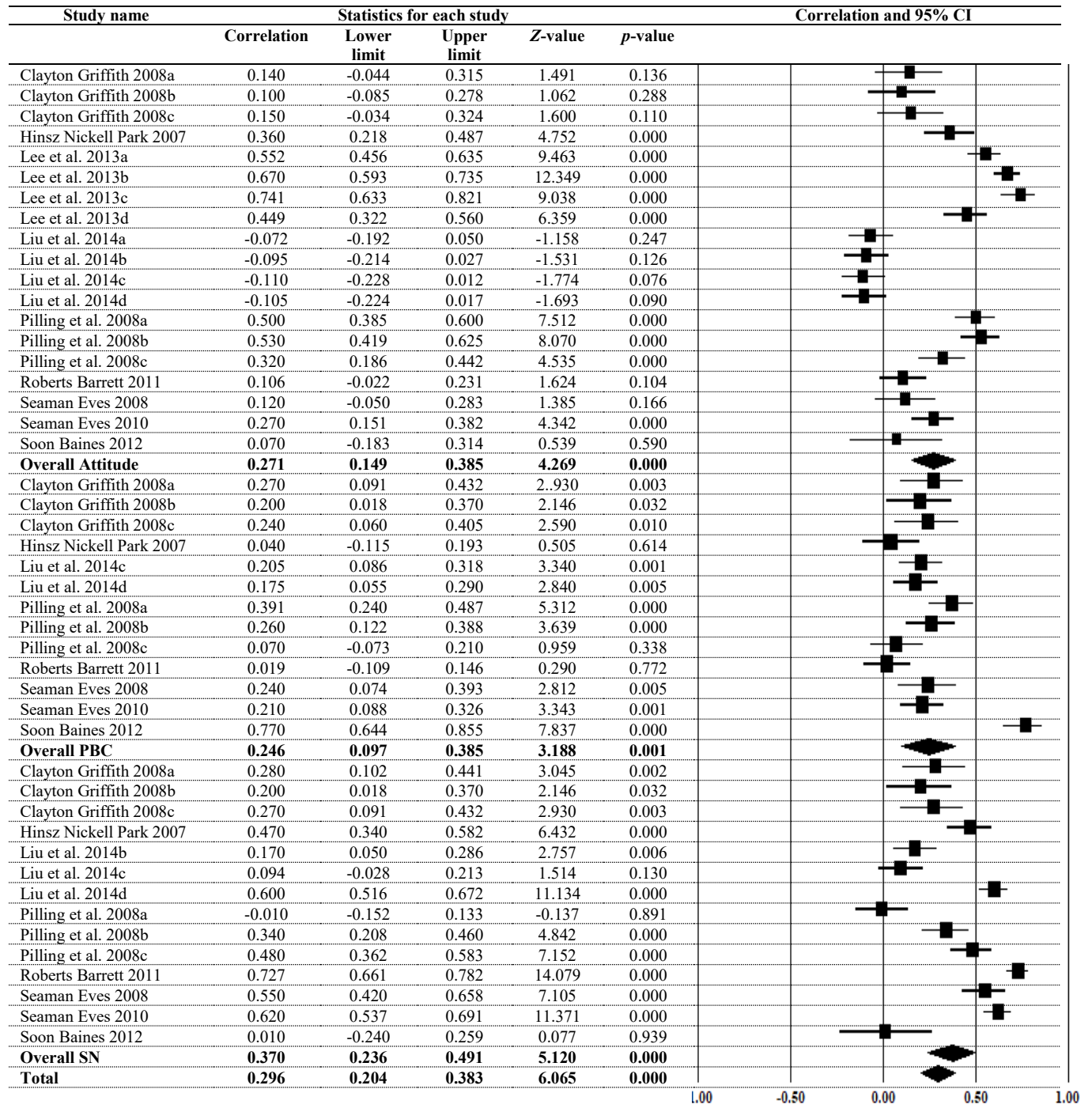
10 **Summary of Study Effects**

11 A random effects summary of food safety attitude, subjective norms, and perceived
12 behavioral control on food safety intention among food handlers was obtained by combining the
13 46 study records in a forest plot (Figure 4.2). Out of the 46 study records, 19 attitude to intention
14 correlations were combined using transformed fisher's Z to combine the random effect size. The
15 results yielded a significant positive mean weighted average of 0.271 (95% [CI] = 0.149 to
16 0.385, $p < 0.01$), with a small to medium effect size (Cohen, 1988).

17 Thirteen records of subjective norm to intention correlations were combined and back-
18 calculated for interpretation. On average, subjective norms had a significant positive mean
19 weighted average correlation of 0.370 (95% [CI] = 0.190 to 0.455, $p < 0.01$), with a medium to
20 large effect size (Cohen, 1988).

21 There were 14 records of perceived behavioral control to food safety behavioral intention
22 identified, with an average significant positive mean weighted average correlation of 0.247 (95%
23 [CI] = 0.096 to 0.386, $p < 0.01$). This relationship is considered to be a small to medium effect
24 (Cohen, 1988).

25 **Figure 4.2.** Forest Plot of the Effect of Food Safety Attitudes, Subjective Norms, and Perceived
 26 Behavioral Control on Food Safety Intention with a Random Effects Summary



27 Note: SN = subjective norms; PBC = perceived behavioral control
 28 Note: Each Study was represented by a filled square (denoting its effect size estimate) and a horizontal line (95% confidence interval).
 29
 30

31 Finally, the combined overall effect size of the TPB constructs to food safety behavioral
32 intention using random effects analysis is 0.282 (95% [CI] = 0.205 to 0.356, $p < 0.001$). The
33 results have provided collective evidence that the theoretical constructs of the TPB can
34 significantly predict the outcome of food safety behavioral intention with moderate effects.

35 The results of all other studies excluding Liu et al. (2014), which has a negative mean
36 effect size of attitude-intention ($r^+ = 0.105$), indicated a significant positive effect of food safety
37 attitude, subjective norms, and perceived behavioral control on increasing food safety behavioral
38 intentions. The range of results derived from the individual studies was diverse, but the
39 estimated overall random effect size was narrower with a considerable smaller confidence
40 interval.

41

42 **Cumulative Forest Plot**

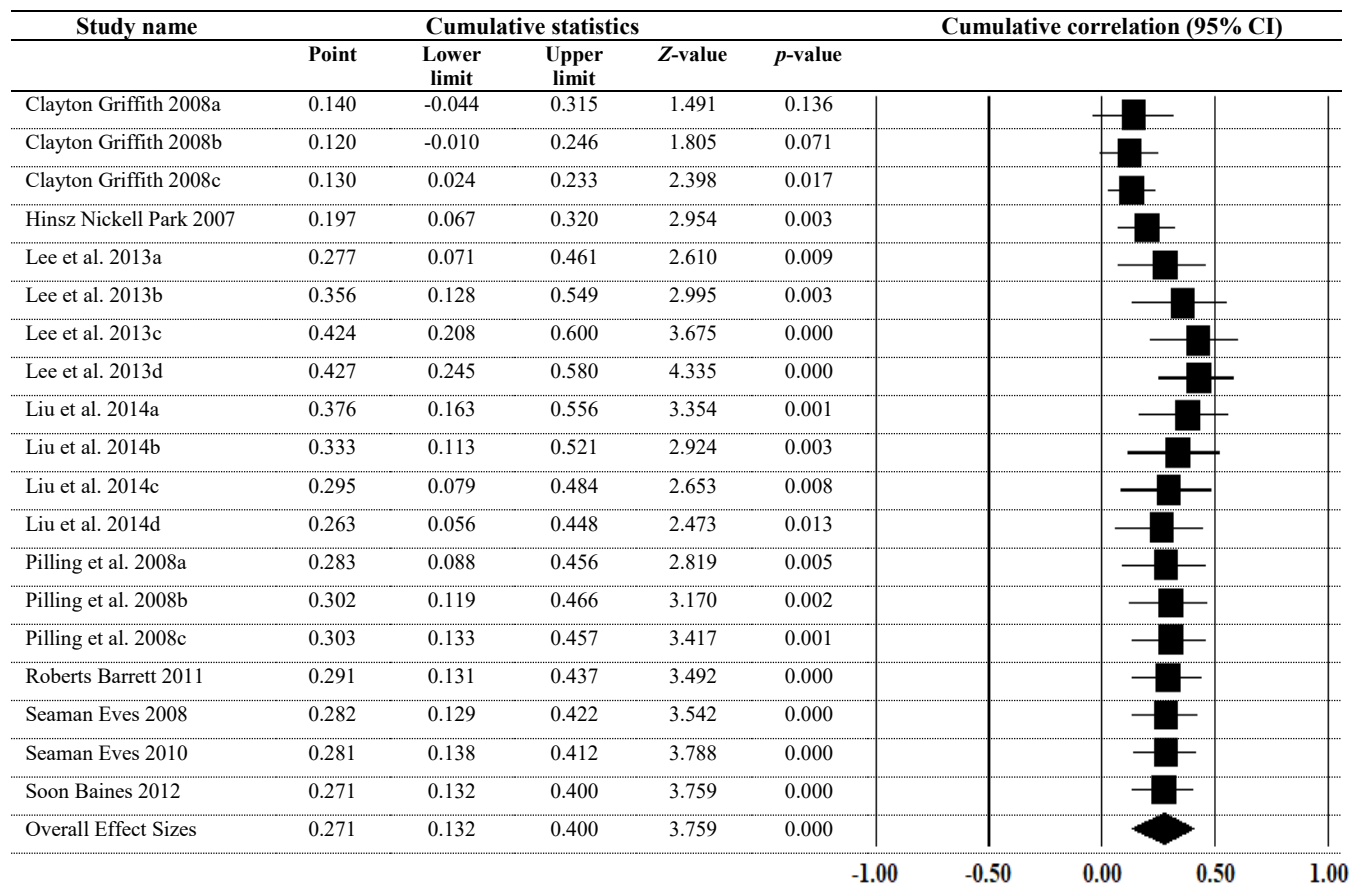
43 Figure 4.3 is a cumulative forest plot in which the first row Clayton and Griffith (2008) is
44 analyzed as a baseline study. The second row is a meta-analysis based on the combined first and
45 second studies, and so on (for e.g., Clayton & Griffith, 2008). The last study to be added was
46 Soon, Baines, and Seaman (2012), therefore the point estimate and 95% CI showed on the line
47 for this study is identical to that shown in the summary effect. By adding studies cumulatively,
48 the point estimates of overall effect size shifted to the right line by line and developed a more
49 consistent pattern. Meanwhile, the cumulative meta-analysis of food safety constructs showed
50 how the body of evidence has shifted over time (See right side of cumulative forest plot).

51 By visualizing the cumulative forest plot of attitude on behavioral intention (Figure 4.3),
52 the effect repeatedly shifts around with some of the included studies (Hinsz, Nickell, & Park,
53 2007; Lee et al., 2013) in which food safety attitude had a drastic positive effect on food safety

54 behavioral intention. This result is not surprising, as both studies examined employee motivation
 55 and their effect on food safety attitude and practices. Given the substantial evidence on the
 56 effects of employee motivation in behavioral research (see Elliot, Dweck, & Yeager, 2017 for a
 57 comprehensive discussion), the collective evidence from this study suggests this might be a
 58 potentially promising area for future research. From the study Liu et al. (2014) and onward, the
 59 effect size begins to diminish, and eventually become consistent around 0.271 with a significant
 60 overall effect size.

61

62 **Figure 4.3.** Cumulative Meta-Analysis of the Effects of Food Safety Attitude on Food Safety
 63 Intention.



64 Note: The summary effect size was estimated each time a study was added.

65

66

67 The cumulative forest plot of subjective norms on behavioral intention (Figure 4.4),
 68 showed a relatively whole picture compared to the previous plots. With each study being added
 69 one by one, the effects of subjective norms slightly increase with an overall effect size of
 70 subjective norms settling around 0.370, with a significant p -value ($p < 0.001$). The effects of
 71 food safety subjective norms tend to be an effective predictor of food safety behavioral intention.
 72

73 **Figure 4.4.** Cumulative Meta-Analysis of the Effects of Food Safety Subjective Norms on Food
 74 Safety Intention.

Study name	Cumulative statistics					Cumulative correlation (95% CI)			
	Point	Lower limit	Upper limit	Z-value	p-value				
Clayton Griffith 2008a	0.280	0.102	0.441	3.045	0.002				
Clayton Griffith 2008b	0.240	0.114	0.359	3.670	0.000				
Clayton Griffith 2008c	0.250	0.148	0.348	4.688	0.000				
Hinsz Nickell Park 2007	0.315	0.184	0.435	4.573	0.000				
Liu et al. 2014b	0.281	0.160	0.394	4.442	0.000				
Liu et al. 2014c	0.247	0.129	0.358	4.037	0.000				
Liu et al. 2014d	0.219	0.107	0.325	3.795	0.000				
Pilling et al. 2008a	0.191	0.081	0.296	0.381	0.001				
Pilling et al. 2008b	0.208	0.105	0.307	3.895	0.000				
Pilling et al. 2008c	0.239	0.128	0.345	4.141	0.000				
Roberts Barrett 2011	0.299	0.136	0.447	3.520	0.000				
Seaman Eves 2008	0.322	0.167	0.461	3.969	0.000				
Seaman Eves 2010	0.349	0.197	0.485	4.340	0.000				
Soon Baines 2012	0.329	0.180	0.463	4.198	0.000				
Overall Effect Sizes	0.329	0.180	0.463	4.198	0.000				

75 Note: The summary effect size was estimated each time a study was added.
 76

77
 78 The effectiveness of perceived behavioral control on behavioral intention (Figure 4.5)
 79 tends to slightly decrease over time with each study being added, the overall effect size is
 80 significant and settled around 0.246. Overall the effects of food safety attitude, subjective
 81 norms, and perceived behavioral control tend to be significantly correlated with food safety
 82 behavioral intention. The food safety employees' subjective norms construct tends to be the

83 most effective predictor of food safety behavioral intention with larger z -value and more pointed
 84 confidence intervals ($\overline{ES} = 0.370, z = 5.120, 95\% [CI] = 0.236 \text{ to } 0.491, p < 0.001$).

85

86 **Figure 4.5.** Cumulative Meta-Analysis of the Effects of Food Safety Perceived Behavioral
 87 Control on Food Safety Intention.

Study name	Cumulative statistics					Cumulative correlation (95% CI)				
	Point	Lower limit	Upper limit	Z-value	p-value					
Clayton Griffith 2008a	0.270	0.091	0.432	2.930	0.003					
Clayton Griffith 2008b	0.235	0.108	0.355	3.589	0.000					
Clayton Griffith 2008c	0.237	0.134	0.335	4.426	0.000					
Hinsz Nickell Park 2007	0.180	0.072	0.285	3.232	0.001					
Liu et al. 2014c	0.186	0.108	0.262	4.626	0.000					
Liu et al. 2014d	0.183	0.122	0.242	5.874	0.000					
Pilling et al. 2008a	0.215	0.137	0.289	5.358	0.000					
Pilling et al. 2008b	0.221	0.154	0.286	6.319	0.000					
Pilling et al. 2008c	0.203	0.135	0.270	5.754	0.000					
Roberts Barrett 2011	0.183	0.111	0.254	4.892	0.000					
Seaman Eves 2008	0.188	0.121	0.253	5.416	0.000					
Seaman Eves 2010	0.190	0.129	0.249	6.069	0.000					
Soon Baines 2012	0.237	0.145	0.326	4.914	0.000					
Overall Effect Sizes	0.237	0.145	0.326	4.914	0.000					

-1.00 -0.50 0.00 0.50 1.00

88 *Note:* The summary effect size was estimated each time a study was added.

89

90 **Continuous Moderation Analyses with Gender, Age, and Work Experience**

91 A series of multi-meta regressions were conducted using food safety behavioral intention
 92 as a dependent variable to determine the influence of age, gender, and years of work experiences
 93 as moderating variables on study effects. The multi-meta regression used random effects fisher's
 94 Z with maximum likelihood estimation, and the Knapp Hartung correction to prevent
 95 counterintuitive effects for estimation uncertainty. The application of the Knapp Hartung ad hoc
 96 correction yields a more conservative inference. Additionally the Variance Inflation Factor was
 97 reported for an indication of multicollinearity. The detail of the meta-regression results is
 98 presented in Table 4.2.

99 **Table 4.2.** Multi-Meta Regression Results of the Moderating Effects of Food Safety Perceived
 100 Behavioral Control on Food Safety Intention.

Covariate	Coefficient	Standard Error	95% Lower	95% Upper	t-value	p-value (2-sided)	VIF
Intercept	1.288	1.031	-0.879	3.455	1.25	0.228	-
Age	-0.004	0.022	-0.049	0.041	-0.19	0.854	3.093
Gender	-1.011	1.050	-3.218	1.196	-0.96	0.349	2.166
Years of Work Experience	-0.021	0.036	-0.097	0.055	-0.58	0.566	3.064

101 *Note:* Simultaneous test that all coefficients (excluding intercept) are zero ($F [3, 18] = 1.39, p = 0.277$), all VIF < 10
 102 *Note:* Goodness of fit: the unexplained variance is zero ($Tau^2 = 0.0698, Tau = 0.2643, I^2 = 93.03\%, Q = 258.35, df = 18, p = 0.0000$)
 103 *Note:* VIF = Variance Inflation Factor; Lower = lower limits; Upper = upper limits

104
 105 The proposed moderating variables, age, gender, and years of work experience did not
 106 significantly moderate the study relationships between attitudes, subjective norms, perceived
 107 behavioral control to food safety behavioral intention. Although all VIF are less than 10, the *F*-
 108 value is small ($F [3, 18] = 1.39, p = 0.277$). One possible explanation could be caused by the
 109 missing data within he included studies. Although, most studies ($k = 22$) reported demographic
 110 variables, a portion of the included studies did not measure any demographic information, (e.g.,
 111 Clayton & Griffith, 2008; Seaman & Eves, 2008, 2010), which meant that the case must be
 112 deleted, thus diminishing the significance of the multi-meta regression test. All corresponding
 113 authors, whose studies were missing demographic data, replied and confirmed the lack of
 114 demographic information. Therefore, future researchers are strongly encouraged to collect
 115 demographic data.

116
 117 **Outlier Analysis**

118 Accounting for errors occurred using the random effect model, when using meta-
 119 regressions with skewed random effect distributions, additional ad hoc analyses like outlier
 120 analyses are recommended (Viechtbauer & Cheung, 2010). Given the random effect variance

121 shifts in the random effect model, the multi-meta regressions used in this study included the
122 maximum likelihood estimation with the Knapp-Hartung method (Doucouliagos & Stanley,
123 2009). The standardized residuals are reported in Table 4.2.

124 A general rule of thumb to identify potential influential outliers with Cook's D method is
125 the residual value should be three times more than the mean (Cook, 1979). Aguinis,
126 Gottfredson, and Joo (2013) noted that when using the Jack-knifed outlier detection technique,
127 any residual score larger than four times the standard observation of the mean should be
128 considered as a substantial outliers. As for the *DFFITs* method to detect influential outliers
129 (Belsley, Kun, & Welsch, 1980), when residuals are two times the square root of the prediction
130 (*DFFITs* > 1), a considerable outlier has been identified.

131 Roberts and Barrett's (2011) subjective norms effect size has been identified as the only
132 and most influential outlier. The residual value included more than four times the standardized
133 residual (*Studentized residuals* = 2.068) and *DFFITs* > 1 (*DFFITs* = 1.92) among a total of 46
134 study records.

Table 4.3. Diagnostics for Outlier Analysis using Random Effects, with Maximum Likelihood Estimation, Knapp-Hartung, with Fisher's Z ($k = 46$)

	Observed	Predicted	Residual	Leverage	Student	Jack-knifed	Cook's D	$DFFITs$	Variance	Tau^{*2}	Sum	Weight	Pct Wt
Hinsz Nickell Park 2007 att	0.377	0.242	0.135	0.187	0.492	0.482	0.019	0.231	0.006	0.071	0.078	12.870	4.6%
Hinsz Nickell Park 2007 pbc	0.040	0.242	-0.202	0.187	-0.737	-0.728	0.042	-0.349	0.006	0.071	0.078	12.870	4.6%
Hinsz Nickell Park 2007 sn	0.510	0.242	0.268	0.187	0.978	0.976	0.073	0.468	0.006	0.071	0.078	12.870	4.6%
Lee Almanza 2013a att	0.621	0.640	-0.019	0.197	-0.071	-0.070	0.000	-0.034	0.004	0.071	0.076	13.206	4.7%
Lee Almanza 2013b att	0.811	0.640	0.170	0.197	0.633	0.623	0.033	0.308	0.004	0.071	0.076	13.206	4.7%
Lee Almanza 2013c att	0.953	0.640	0.312	0.181	1.101	1.107	0.089	0.520	0.011	0.071	0.083	12.118	4.3%
Lee Almanza 2013d att	0.483	0.640	-0.157	0.193	-0.577	-0.567	0.027	-0.277	0.006	0.071	0.077	12.955	4.6%
Pilling Brannon 2008a att	0.549	0.336	0.213	0.102	0.743	0.734	0.021	0.247	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008a pbc	0.388	0.336	0.052	0.102	0.181	0.177	0.001	0.059	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008a sn	-0.010	0.336	-0.346	0.102	-1.210	-1.226	0.055	-0.412	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008b att	0.590	0.336	0.254	0.102	0.886	0.880	0.030	0.296	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008b pbc	0.266	0.336	-0.070	0.102	-0.246	-0.240	0.002	-0.081	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008b sn	0.354	0.336	0.018	0.102	0.061	0.060	0.000	0.020	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008c att	0.332	0.336	-0.005	0.102	-0.017	-0.016	0.000	-0.006	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008c pbc	0.070	0.336	-0.266	0.102	-0.930	-0.927	0.033	-0.312	0.005	0.071	0.077	13.028	4.6%
Pilling Brannon 2008c sn	0.523	0.336	0.186	0.102	0.651	0.641	0.016	0.215	0.005	0.071	0.077	13.028	4.6%
Roberts Barrett 2011 att	0.106	0.406	-0.300	0.190	-1.111	-1.118	0.096	-0.542	0.004	0.071	0.076	13.209	4.7%
Roberts Barrett 2011 pbc	0.019	0.406	-0.387	0.190	-1.435	-1.479	0.161	-0.716	0.004	0.071	0.076	13.209	4.7%
Roberts Barrett 2011 sn	0.922	0.406	0.516	0.190	1.910	2.068	0.285	1.001	0.004	0.071	0.076	13.209	4.7%
Soon Baines 2012 att	0.070	0.500	-0.429	0.062	-1.368	-1.402	0.041	-0.362	0.017	0.071	0.088	11.317	4.0%
Soon Baines 2012 pbc	1.020	0.500	0.521	0.062	1.659	1.746	0.061	0.450	0.017	0.071	0.088	11.317	4.0%
Soon Baines 2012 sn	0.010	0.500	-0.490	0.062	-1.559	-1.625	0.054	-0.419	0.017	0.071	0.088	11.317	4.0%

Note: Observed = observed effect size; Predicted = predicted fitted value T^* ; Residual = the unstandardized residual value; Student = studentized residual; Leverage = leverage influential point; Jack-knifed = Jack-knifed outlier technique; Cook's D = Cook's distance; $DFFITs$ = degree of freedom fitness; Tau^{*2} = modified Thompson tau test;

Note: Sum is the total variance of the i^{th} effect size, which is v_i in fixed effect meta-regression or $\tau^2 + v_i$ in random effects meta-regression

Note: The weight of the i^{th} study, w_i , is the actual (raw) weight assigned to this study in the analysis, namely the reciprocal of the total variance, namely $w_i = 1/v_i$ in fixed effects meta-regression and $w_i = 1/(\tau^2 + v_i)$ in random effects meta-regression.

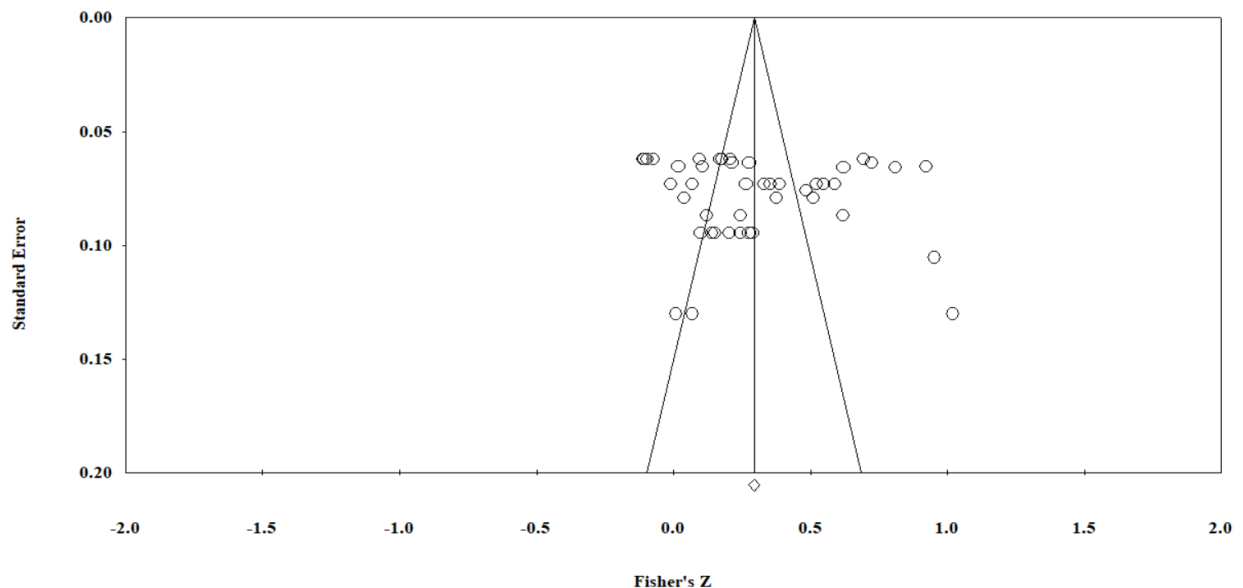
Note: Pct Wt = percentage weight for the i^{th} study is the percentage of the total weight accorded to study, that is w_i divided by the sum of all study weights.

Measurement Correction and Publication Bias Analyses

Funnel Plot Asymmetry Test

The funnel plot is a useful tool to visually assess potential publication bias (Gallin & Ognibene, 2012). A funnel plot is a visual representation of the estimated effect (plotted on the horizontal axis) versus the reciprocal of its standard error (plotted on the vertical axis). All studies were visualized with funnel plots (See Figure 4.2). If publication bias is present, the funnel plot will become less asymmetry. The funnel plot in this study is well balanced, with slightly more studies toward the left (representing a small correlation effect), and about the even amount toward the right. A clustering of larger or more significant studies emerged slightly toward the top of the plot and clustered around the mean effect size. The base of the plot had fewer results, indicating a smaller number of negative-result studies were included in the analysis (Glasziou, Irwig, Bain, & Colditz, 2001). The visualized funnel plots show there is no apparent nor significant level of heterogeneity being observed.

Figure 4.6. Funnel plot using the included food safety behavioral studies, suggesting low evidence of publication bias (Begg’s test, $p = 0.297$; Egger’s regression, $p = 0.502$).



Trim and Fill Method

Additional, the Begg's test and Egger's Regression were used to examine the level of publication bias. The results revealed no significant evidence of publication bias for the effects of food safety attitudes, subjective norms, perceived behavioral control on food safety behavioral intention, ($Tau = 0.106$; $p = 0.297$) and Egger's regression, ($t_{44} = 0.676$, $p = 0.502$).

Fail-safe N Effect Size Analysis

Publication bias can be corrected through a sensitivity analysis that allows an estimate of its potential impact on the conclusions using the fail-safe N method (Glasziou et al., 2001). The lower the fail-safe N , compared with the number of studies included in the meta-analysis, the more likely it is that the study presents flawed conclusions. The fail-safe N also provided the number of studies that would be required to move an observed significant effect to non-significant.

The study fail-safe N is 8,478, which is the numbers of missing studies that would bring p -value to be higher than alpha, which suggest that more than 8,478 studies with an effect size of 0 would need to be added to the meta-analysis before the effect would become statistically nonsignificant. This study included 46 records of food safety intention among foodservice workers. Because it is unlikely that 8,478 studies were missed during the search procedure, the results presented in this meta-analysis are robust and significant.

Data Heterogeneity and Explained Variances

An important function of meta-analysis is the investigation of between-study heterogeneity, which helps to understand study variation and generate hypotheses for future

analyses. Results indicate the level of between-study heterogeneity is not significant ($Q = 1.851$, $df=2$, $p = 0.396$). Given the Q statistic is non-significant, the estimation of the heterogeneity is not important, and a satisfactory degree of homogeneity is achieved.

A regression with no covariates was conducted to compute the total variance in true effects. The total variance for a study is the sum of the within-study variance and the between-study variances. The difference between these values gives the total variance explained. The total variance of all TPB studies included in this particular meta-analysis explained of 22% in true effect total variances ($R^2 = 0.22$), thus a considerable amount of variance is still unexplained (78%).

Discussion

This meta-analysis investigated the relative effectiveness of TPB variables and their relationship with food safety behavioral intention. An overall random effect size of the TPB constructs predicts food safety behavioral intention, with a positive and significant relationship ($\overline{ES} = 0.282$, $p < 0.001$). Therefore, the results of the study provide evidence that individual attitude, subjective norms, and perceived behavioral control increases food safety behavioral intention. The weighted average correlation from each independent variable ranged from 0.247 to 0.370, with medium to large effect sizes. The results are similar across all different food safety behaviors, as the total between study variance and heterogeneity ratio using the random effects model was low and not significant. Therefore, the results noted that although food safety practices were conducted in various working and service environments, the cognitive process of individual employees to food safety behavior tends to be similar between studies. Overall, this

meta-analysis verified and confirmed the comprehensive functionality of using the TPB to improve food safety behaviors within foodservice domains.

Most studies collected in western culture tend to have significant level of heterogeneity due to dense representation of minority groups in the total population in western social systems. Also, the limited sample size desegregation of each study contained different languages (English, Spanish, and Chinese language surveys) that collected data across different ethnic groups. This is specifically true in terms of restaurants and foodservice organizations. Although foodservice employees in the western culture represent a diversity of cultural backgrounds, the study results implied foodservice employees hold a robust cognitive process in terms of food safety intentions with little to no significant differences between study heterogeneity. Considering different environmental influences from vastly different restaurant types and geographic locations in both UK and US, the TPB model is surprisingly robust in terms of predicting food safety intention with medium effect sizes indifferent from languages used.

The results indicated that subjective norms tend to be the most influential construct in terms of identifying and predicting food safety behaviors, compared to other variables within the TPB. One possible explanation could be subjective norms are strongly influenced by the specific individual, who might approve or disapprove of the specific food safety behavior (Ajzen, 1991). More specifically, the observation of others' action, by leaders or by other employees, might intensively fine tuned individual norms, which impacts the individuals' personal beliefs about whether or not to perform food safety behaviors. Another possible explanation is the group norms, where the group tends to have shared beliefs about food safety behaviors. Studies with a large sample tend to have significantly stronger individual subjective norms, thus the group encourage others to act correspondingly to the group's culture and identities. Future qualitative

studies are encouraged, which help understand why the subjective norms to intention relationships are stronger with foodservice employees, how to further improve these relationships, and what kind of intervention strategies will be useful to change employee's negative normative beliefs. Future researchers should also consider differentiating large operations from those that are smaller to compare and contrast why large operations tend to have significantly stronger subjective norms

The multi-meta regressions included an outlier analysis distinctively made with three contextual moderators that are important to employee's personal beliefs about the behavioral intent of employees to follow food safety practices. The results noted that Roberts and Barrett's (2011) subjective norms were considered as the most substantial outlier in regard to average effect sizes that were collected in this review, which had an outstanding positive effect size among all 46 study effect sizes (*Studentized residuals* = 2.34, *DFFITs* = 1.92). Upon further investigation, restaurant managers tend to have a stronger than normal subjective norms to intention relationship in terms of offering food safety training to employees. Restaurant or foodservice managers usually have a plethora of responsibilities related with food safety practices, thus feel stronger intention to provide food safety training to their employees. Additionally, restaurant managers are more likely to evaluate the opinions of crew members and colleagues in terms of forming good support for food safety training. Although intention to offer food safety training is considered as a form of food safety behavior, it is less interest to the purpose of this study, which can be a subject for future studies.

One significant contribution of this meta-analysis included a quality assessment and evaluations of the included study characteristics. The results noted that less than half of the studies included in this study utilized an elicitation study, and even less applied the TACT

elements of the behavioral definition to improve accessible behavioral outcomes. An elicitation study is strongly recommended with the application of the TPB (Fishbein & Ajzen, 2011) to identify accessible behavioral, normative, and control beliefs. The same principle applies to the use of TACT elements, as the quality of the TPB measurement items can ensure that participants know a) who is the target of the item, b) what action is being considered, c) the context where the action is necessary and d) what the timeframe is for the action. Although variation between studies is expected, future food safety researchers are encouraged to clearly define the food safety action using the TACT elements, thus the arbitrary latent variables can be examined.

The explained variance of all included TPB studies only explained a combined variance of 22% in true effect variance. Thus, the application of the TPB to the food safety domain could use some improvement, considering a large amount of variance is still unexplained (78%). Future research should consider including new independent variables or adding conditional moderators and contextual explanations to help increase overall explained variances in food safety behavior.

Recommended interventions to improve food safety practices

Based on the results from the forest plots and overall cumulative analyses, it is recommended that interventions aimed at improving food safety behavior should target individual subjective norms. While previous interventions have focused on targeting individual attitudes (e.g., York et al., 2009), less work has been done on the subjective norms to intention relationship. One possible reason for the lack of interventions targeting norm constructs may be due to the lack of understanding with employees' normative beliefs. Foodservice employees

face different social influences daily from peoples in different aspects of social activity, thus targeting various behavioral norms for intervention can be a difficult task for researchers.

Another possible reason for lack of intervention might be due to the differences between injunctive norms versus the descriptive norms. Subjective norms usually refer to the injunctive norms, which implicate the beliefs that important others want them to perform or not perform the food safety behaviors. However, it is important to note that descriptive norms, which are more commonly utilized within a group or culture, refer to the observations of what other people commonly do (or whether they conduct the behavior themselves), and is considerably different than injunctive norms.

Although, injunctive norms usually refer to the desirable behavior, descriptive norms can also have a strong impact to individual's beliefs about the common food safety behaviors in a specific work environment. Additional psychological constraints can occur due to the inconsistency in anticipated support from important others to food safety behaviors. For example, managers or company regulations might impose strong injunctive norm beliefs about food safety procedures. If employees observe managers who do not follow these food safety procedures, psychological constraints might where employees simply will not implement safe practices because they don't feel their mangers truly value proper food safety practices. However, research distinguishing between these two concepts is lacking within the foodservice domains, and it is recommended that future research explores this important distinction.

Methodological contribution to the TPB

This meta-analysis has a number of strengths. First, this review captures the surge of research interest in testing whether the TPB can serve as an adequate model to measure food safety behaviors.

Second, past systematic reviews and meta-analyses of the TPB have focused exclusively on food safety training and educational effectiveness, but not actual food safety behavior among employees. Previous reviews related to food safety training and education are narrative focused and did not combine the effect sizes.

Third, this review helps to demystify the conflicting results about perceived control within the existing literature. The study results noted an overall positive perceived control to behavioral intention relationship between studies, thus implying that an individual's control beliefs and perceived barriers are important personal constructs to predict food safety behaviors. For example, employees with low perceived control are more likely to believe there are no gloves of their size available, or cleaning supply are always out of stock, which can pose threat psychologically to proper food safety practices even before they are trying. These perceived behavioral controls will more than likely to be transferred to personal beliefs, adding irrational barriers to perform food safety. Managers needs to provide adequate training and retraining, correct incorrect behaviors on-site, monitoring food safety adequately during rush hours, and ensure all food safety supplies are available, thus minimize any perceived behavioral control that limits the correct food safety practices.

Limitations

Although a variety of controls were implemented for publication bias, results reported in this study are not without limitations. First, the study selection was conducted to be as inclusive as possible. However, it is possible that there are studies conducted within the food safety literature that are very similar to the Theory of Planned Behavior without the easily identifiable title or keywords, thus they could have been inadvertently omitted during the literature review.

Second, although meta-regression results are not significant, there could be potential moderators that might affect the study relationships. Future researchers should test more contextual moderators considering the drastically different sociological and environmental background of foodservice industry.

Third, the TPB is not without limitations. Thus, to fully explain food safety-related behaviors in the foodservice content, the TPB may need to incorporate additional, post-intentional variables (Sniehotta, Presseau, & Araújo-Soares, 2014). A good future strategy would be to conduct qualitative studies to investigate and explain the common observed variables first, then to explore possible new variables to enrich the existing understanding of the food safety behavior.

Additionally, this systematic review and meta-analysis have methodological limitations. Because none of the studies investigated food safety behavior longitudinally, we were unable to analyze patterns of multivariate models on multiple occasions with different time frames. Future researchers are encouraged to apply longitudinal models, accessing previous behaviors, and considering multiple occasions.

Lastly, Davey, Turner, Clarke, and Higgins (2011) noted that the median number of studies included in meta-analyses was three. Thus, analyses presented in this review are

comparable with APA standards. However this food safety meta-analysis could use more studies with stronger measurements, which can, in turn, help with analytical precision and reducing bias.

Conclusion

The current systematic review and meta-analysis provide strong evidence to support the utility of the TPB applied to food safety and intentions. Specifically, attitudes, subjective norms and perceived behavioral control had a medium to large effect size in regard to the relationship with intentions, which in turn is related to food safety behaviors. Thus, future intervention tests of the TPB should target subjective norms as a primary target to improve food safety practices. Additionally, researchers are urged to use the elicitation study, and TACT elements to design stronger measurements for future research. With improved food safety intentions and practices, some of the practical implications will likely translate into reduced health care costs, strengthened food safety culture, and the overall health of public well-being.

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Chapter 5 - Capturing the Normative Beliefs that form Individual Food Safety Behavioral Intention: A Qualitative Explanatory Study

Abstract

Reports from the Center for Control Disease and Prevention suggest that approximately 61% of foodborne illness were attributed to improper food handling and is the leading cause of outbreaks in the foodservice industry. However, research has shown that even when employees are trained in food safety, knowledge does not always translate into improved practices on the job. According to a previous meta-analysis, subjective norms are the most important behavioral construct related to predicting food safety behavioral intentions (Lin & Roberts, 2018). Relevant results also reported a small combined variance of true effect size (22%), which indicates a large amount of variance (78%) related to food safety behavioral intention is still unexplained. Therefore, the purpose of this study is to identify and explore the unobserved heterogeneity constructs related to predicting employees' food safety behavioral intention.

An online questionnaire was distributed to foodservice employees to measure individual-level norms about food safety practices. Then, the sample was divided into two groups (low versus high) using six Likert-type normative questions. Open-ended questions (14) helped to create qualitative narrative texts for analyses to establish a demographic profile of the participants. ATLAS.ti (V.7) was used to ensure data security, organize coding and document analysis. Theory-ground phenomenology, founded by Edmund Husserl (1970, 2012), guided the analytical process for this study. The code list and definitions were refined with circular analysis and illustrated using diagram.

A total of 104 responses from foodservice and restaurant employees were documented for coding. Most participants were female, with a mean age of 36 and an average of about 11.2

years of foodservice industry experience. The results indicated that employees are usually not influenced if other managers or coworkers' approve or disapprove of their behavior. Instead, their behavior is guided by an innate motivation for ethical consideration and moral reasoning. The data further noted that participants experience injunctive (subjective) norms, but more from a retrospective formation, rather than a forward-looking expectance regarding food safety practices. Additionally, intrinsic motivation should be an important antecedent construct to form normative beliefs of food safety-related behaviors. The findings of the study challenge the previous understanding of causal inference directions regarding normative pressure. Future research are discussed.

Keywords: Injunctive Norms, Descriptive Norms, Behavioral Intention, Phenomenology, Criterion Design.

Introduction

Dining out, or purchasing food to-go, has become an everyday part of life for every American. According to National Restaurant Association ([NRA], 2017), nine out of 10 U.S. consumers say they enjoy going to restaurants, and eight out of 10 say dining out with family and friends is a better use of their leisure time than cooking themselves. In 2017, consumers spent almost \$0.48 of every dollar planned for food in a restaurant or other retail operation (NRA, 2017). The increased role that restaurants play in the everyday lives of all Americans has increased consumer awareness of foodborne illness and proper food handling practices (Belasco, 2014). With the emerging risks and issues related to food safety, widespread attention has focused on the food industry and regulators (Lofstedt, 2013). Approximately, 42% of consumers indicate that they would complain about social media if they observed food safety concerns in a restaurant (Trendsource, 2016). Another 39% indicate they would not return to a quick service operation if it were involved in a foodborne outbreak (Trendsource, 2016). However, foodborne outbreak and illness-related death continue in the United States.

In 2015, 902 foodborne outbreaks were reported in the United States, resulting in 15,202 illnesses, 950 hospitalizations, and 15 deaths (CDC, 2017). In the United States, approximately 61% of foodborne illness outbreaks were attributed to a lack of personal hygiene and improper food handling by employees in the foodservice industry (Angelo, Nisler, Hall, Brown, & Gould, 2017). As in previous years, restaurants were the most commonly reported location of foodborne illness outbreaks, with a total of 469 outbreaks, yielding 4,757 associated illnesses (CDC, 2017). Other reports suggested that over three-quarters of all cases of foodborne illness are attributed to improper food handling by employees in the foodservice industry (Almanza & Nesmith, 2004; Griffith, Livesey, & Clayton, 2010). Additionally, most observational studies on food safety

practices report low conformity with food safety practices at work (Clayton & Griffith, 2004; Green et al., 2007; Howes et al., 1996; Roberts et al., 2009; York et al., 2009).

One strategy to improve food safety behaviors at work, which many states adopt, is to require mandatory food handler training and certification (Food and Drug Administration [FDA], 2013; 2017). By offering mandatory food safety training, foodservice employees help establish preventative control and build trust among consumers. However, many studies have reported current knowledge-based training has many limitations and does not change food safety behaviors. One major reason is that improving food safety knowledge does not always translate into improved food safety behavioral intention or behavior (Chapman et al., 2010; Debess et al., 2009; Green et al., 2007; Roberts & Barrett, 2009, 2011; Powell, Jacob, & Chapman, 2011; York et al., 2009). Thus, over the past decade, previous researchers have examined the gaps in food safety knowledge and work-related behaviors (Arendt, Paez, & Strohbehn, 2014; Kwon et al., 2012; Roberts et al., 2008, 2009; Yu et al., 2018).

The lack of practical theory to explain or predict food safety behavior has led to difficulty in designing interventions to improve current food safety educations (Sivaramalingam et al., 2015). Due to the dynamic and complex environment in the foodservice industry and the representation of the multicultural heterogenous working population in the U.S., empirical evidence related to predicting food safety behavior and relative controlled interventions are rare. For example, a meta-analysis reviewed food safety training literature from 1980 through 2014 and noted that only a small handful of studies utilized an experimental, random, and controlled study design with an intervention ($n = 4$ of 602 total; Medeiros et al., 2011). Most studies (52%) included in the meta-analysis did not report or specify measurement instruments, 35% did not report the post-intervention follow-up, and more than 40% reported statistical outcomes that

were insufficient (Sivaramalingam et al., 2015). Among the only four intervention designs identified by the meta-analysis (Sivaramalingam et al., 2015), no study captured the full range of critical food safety practices recommended by the FDA (i.e., cross-contamination, inadequate personal hygiene/hand washing, and time/temperature abuse; FDA, 2013). Therefore, due to the lack of high-quality evidence, the effort to improve food safety training and conduct behavioral training is still difficult. Specifically, there is a lack of specific behavioral theories dedicated to guiding food safety management.

Qualitative methods are essential tools to explain and explore complex and dynamic scenarios (Macgowan, 2008). Thus, adopting qualitative methods could help us understand employees' experience with results utilized to develop strong theories related to inducing and promoting food safety behavioral intentions and actual behaviors (Arendt et al., 2014). Additionally, the qualitative data can help discern and describe social influences and phenomenon related to food safety behavioral intention and organizational culture. According to a previous meta-analysis, subjective norms are the most important behavioral construct related to predicting food safety behavioral intentions (Lin & Roberts, 2018). Therefore, this study is anchored upon Cialdini's Norm Theory (2003) and Ajzen's Theory of Planned Behavior (TPB; Fishbein & Ajzen, 2011). The purpose of this study is to identify and explore the normative beliefs related to predicting employees' food safety behavioral intentions.

Literature Review

The Intention-Behavioral Gap

Current evidence suggests intentions get translated into action approximately 50% of the time (Sheeran & Webb, 2016). An analysis of the problem suggests that people striving to enact

their intentions must have a goal, initiate and maintain the behavior to close the intention-behavior gap (Sheeran & Webb, 2016). However, behavioral intention still offers a superior prediction of behavior in correlational tests compared to other cognitions, including explicit and implicit attitudes, norms, self-efficacy, perceptions of risk and severity (Sheeran et al., 2014), and personality factors (Chiaburu et al., 2011). These findings would seem to suggest that forming an intention is still an important construct for cognitive behavioral change (Sheeran & Webb, 2016).

Predicting Food Safety Behavioral Intention in Foodservice Management

The TPB offers a prediction of the behavior using behavioral intention as the intermediated predictor before the actual behavior (Fishbein & Ajzen, 2011). In the context of the TPB (Fishbein & Ajzen, 2011), attitudes, subjective norms, and perception of behavioral control combine to produce intentions that determine the performance of the behavior (Fishbein & Ajzen, 2011). However, researchers have noted that each behavior must be examined and better understood in which the behavior is executed. Lin and Roberts (2018) conducted a meta-analysis targeting food safety behavior with foodservice employees to test whether the TPB model can be applied to predict food safety behavioral intentions.

Lin and Roberts (2018) identified a total of 1,550 study records relevant to predicting food safety behavioral intentions. After screening for duplicated records and datasets, improper measurement or design, non-foodservice related samples, 1,504 studies were excluded, with a total of 46 study records coded for meta-analyses. The results indicated a significant positive predictor of food safety behavioral intention using the TPB constructs ($r^+ = 0.282$; $p < 0.001$) with a medium to large effect size. The results were robust with a lower level of between-study

heterogeneity, indicating the cognitive behavioral processes were not significantly different regarding ethnic background and locations of employees. Subjective norms were identified as the most influential behavioral construct related to predicting food safety behavioral intentions. However, the meta-analysis results reported a small combined variance of true effect size (22%). Thus, 78% of the variance related to predicting food safety behavioral intentions is left unexplained. Therefore, the explanation of the food safety behavior and the prediction of employees' food safety cognitive process remains limited.

The TPB provides a theoretical foundation for evaluating food safety behavior. However, the theory needs considerable improvement and adaptation related to predicting food safety behavior in the foodservice environment. With a limited amount of research devoted to improving food safety behavioral theory, the lack of theoretical guidance continues to restrain the improvement of food safety education (Green et al., 2007; York et al., 2009), behavioral conformity (Roberts & Barrett, 2009, 2011), and food safety culture (Powell, Jacob, & Chapman, 2011), thus leading to ineffective training programs (Yapp & Fairman, 2006). Other researchers also advised the importance of improving behavioral theories to help improve food safety behaviors (Starbird, 2000; Roberts et al., 2008, 2009; Yu, 2018, Veiros et al., 2009). Therefore, a thorough understanding of foodservice employee's experience can help improve food safety behavioral theories, thus reducing barriers to performing food safety behaviors.

Subjective Norms

Subjective norms are defined as an individual's perception that most people who are important to them think they should (or should not) perform a particular behavior (Fishbein & Ajzen, 2011). The term subjective norm originally referred to a specific behavioral prescription

or prescription attributed to a generalized social agent (Ajzen, 1991). It was a person's perception that important others prescribe, desire, or expect the performance or non-performance of a specific behavior. The term subjective norm was used because this perception may or may not reflect what most important others think should be done (Ajzen & Fishbein, 1980).

Meta-analyses have confirmed the theoretical validity of using subjective norms to predict individual behavior in both social psychology and management journals (Manning, 2009; Scheper & Wetzels, 2007; Sheeran et al., 2014, 2017). Various correlational studies also suggested that subjective norms are significant predictors of individual behavior (Rivis & Sheeran, 2003). Previous meta-analyses also supported using different types of individual normative beliefs to predict subjective norms in a range of behavior types (Manning, 2009; Scheper & Wetzels, 2007; Sheeran et al., 2016). Additionally, the most popular assessment of subjective norms was done in an expectancy-value formation and was also considered parsimonious (Ajzen, 1991; Wigfield, Tonks, & Klauda, 2009).

In the expectancy-value formation, each normative beliefs (nb_i) is multiplied by his/her motivation to comply with the behavior (mc_i), the following equations would then illustrate subjective norms $\sum_i nb_i mc_i$ (Fishbein & Ajzen, 2011). Normative beliefs constitute the basis for perceived social pressure (Ajzen, 1991). For example, an individual might believe it is extremely likely that one's manager would approve of him practicing food safety, but only somewhat likely that his friends would approve of the same practice. If the motivation to comply with one's friends is stronger than the motivation to comply with their manager, then this individual will only experience a moderate amount of social pressure to perform a food safety behavior (Ajzen, 2005).

This formation offers detailed operationalized guidelines for measurement (Ajzen, 2005; Conner & Sparks, 2005; French & Hankins, 2003), analysis (Hankins et al., 2000), interventions (Sutton, 2001), and longitudinal follow-up (McEachan et al., 2011). Thus, the use of the expectancy-value formation measurement is considered robust in an applied setting due to the clearly defined applicable guidelines and analysis. Therefore, it is important to identify the type of normative beliefs and relevant factors that motivate the actions of beliefs to help understand the employee's individual experience.

RQ1: What are the main factors that affect the normative beliefs of individual foodservice employee?

The Theory of Normative Influences and the Descriptive Norms

Although it is essential to access the subjective norms and motivation to predict food safety behavioral intention, the previous meta-analysis indicated the overall explained variance in food safety behavioral intention is small (22%) leaving considerable room for improvement (Lin & Roberts, 2018). Although the subjective norms showed strong relevance in predicting food safety behavioral intention in the previous meta-analysis, Cialdini (2003) argued that subjective norms only constitute one form of the normative influences, also known as injunctive norms and that other norms contribute to the overall normative pressure and influence the behavior.

The work of Cialdini (2003) and Cialdini and Goldstein (2004) argued that in addition to believing that individuals or groups do or do not want us to perform a given behavior, we might also experience descriptive norm pressure. Descriptive norms can be defined as perceptions that others are or are not performing the behavior themselves, whereas injunctive norms refer to

perceptions concerning what should or ought to be done regarding a given behavior (Cialdini & Goldstein, 2004; Cialdini, Reno, & Kallgren, 1990).

The two types of norms act in unison to better explain the overall normative influences. In addition to the already proposed expectancy-value formation from the TPB (Fishbein & Ajzen, 2011), this study also investigates the descriptive norms of foodservice employees.

RQ₂: What are the main factors that affect the descriptive beliefs of individual foodservice employee?

Cialdini and Goldstein (2004) suggest that descriptive norms can influence behavior by providing evidence as to how individuals learn by watching others, and whether a norm violation is common or not. If most others are performing a given behavior, people may well assume that it is a rational thing to do under the circumstances or environment. The influence would become especially relevant if these others are superiors in the workplace, for example, managers or leaders (Reno et al., 1993). By merely observing what most others are doing in a specific situation and by imitating their actions, one can usually take an information-processing advantage and a decision-making shortcut when choosing how to behave in a given situation (Kallgren et al., 2000). Cialdini (2003) argued that by imitating the actions of others, one could behave efficiently and rationally based on the given environment.

It is possible that injunctive and descriptive norms are congruent. For example, individuals who join a new team may notice that, because most others are silent and attentive when working (descriptive norms), they are required to act similarly, and they will incur social sanctions if they do not comply (injunctive norms; Lapinski & Rimal, 2005). Similarly, it could be hypothesized that when people observe others engaging in a specific behavior, they likely

conclude that the behavior is socially acceptable, hence few social sanctions will be incurred by engaging in the behavior. By observing that only a few engage in the behavior could result in the belief that the behavior is socially unacceptable (Lapinski & Rimal, 2005).

Cialdini's (2003) view further implies that in addition to the direct effect on behavior, descriptive norms also have indirect effects. First, one may notice that if others' behavior is rewarded or punished, and this information can influence attitudes toward the behavior and lead to the injunctive beliefs that the behavior is prescribed or criticized (subjective norms). Second, one can learn that behavior leads to enjoyment or exciting outcomes, thus causing more people to imitate the behavior. It can also serve as an important motivator for them to act on the behavior themselves (Cialdini & Goldstein, 2004).

Combined with the existing understanding of the theories about norms, the positive/negative evaluation of others' behavior may play an important role in evaluating the food safety culture within an organization and the group norm (Rivis & Sheeran, 2003; Terry & Hogg, 1996). Thus, this may help to explain better why it is important to evaluate both norms to contribute to the prediction of intentions and actions (Lapinski & Rimal, 2005). A positively evaluated group norm can be further emphasized through the communication of company policies, the organizational knowledge, and consensual decision making made by individuals' understanding of the organizational culture.

RQ3: What are the shared beliefs in the group that affects the food safety practices of individual foodservice employee?

Methods

Project Approval and Human Subject Protection

Before data collection, the study protocol was approved by the Kansas State University Institutional Review Board (IRB # 9234). The relative modification after pilot study results was also approved (IRB # 9234.1). The approval letters are included in Appendix A.

Pilot Studies

Before primary data collection, the instruments were screened by a panel ($n = 3$) of food safety researchers for face validity and content clarity. Then a pilot test was conducted, with an online convenience sample distributed to 24 employees within a 50-mile radius from a Midwest university. A total of six restaurant employees completed the survey. The pilot study discovered some wording issues, which included grammar and using an overly complexed vocabulary, which had an overall Flesch-Kincaid Grade Level of 18. The researchers reworded some of the questions and downgraded the readability grade level to a Flesch-Kincaid grade level of 7.2. Another pilot study was then conducted with a total of seven usable responses out of 20 distributions. The pilot study helped determined average response time, helped ensured there were no additional wording issues, and that each section could be viewed correctly on both mobile and desktop platforms.

Research Design: Sampling Strategy and Recruitment Process

Purposeful sampling strategies were used for this study. Recommended by the Mixed Methods International Research Association (Kemper, Stringfield, & Teddlie, 2003; Teddlie & Yu, 2007), purposeful sampling helps increase the sampling heterogeneity, thus helping generate

rich content, which can lead to a profound understanding of the cognitive process of the behavior.

Nesting purposeful sampling strategies were used to increase sampling heterogeneity (Mertens, 2014). This research follows a two-part sampling process, which included both quantitative and qualitative measures (Creswell, 1998). To collect data Crusoe Development Inc., an external marketing company that has panels available for research was utilized. Crusoe sent the Qualtrics-based questionnaire to participants across the United States, and surveys were collected until a minimum of 50 participants responded from both the low and high normative groups (Mertens, 2014). Each completed participant was provided \$4.10 as compensation for their time completing the survey. First, an online questionnaire was used to measure individual-level norms using six questions. The second part of the questionnaire containing 14 open-ended questions to help create qualitative narrative texts. The detail copy of the questionnaire is included in Appendix B.

Part 1: The Survey Measurement

Six pre-established 7-point Likert-type scales were utilized to help increase sampling heterogeneity and allow comparison and document normative influences. These six subjective norms measurements were drawn from the literature (Courneya et al., 2010; Fishbein & Ajzen, 2011) and included both injunctive and descriptive norms. An example of the questions related to injunctive norms included influence from important people, (“*Most people who are important to me would approve of me following food safety practices at work regularly over the next 12 weeks.*”), and anticipated support (“*Most people who are important to me would support me if I follow proper food safety practices at work over the next 12 weeks*”). Questions related to

descriptive norms included “*My coworkers will follow proper food safety practices at work regularly over the next 12 weeks.*”, And “*My boss or managers follow proper food safety practices at work regularly over the next 12 weeks*”. All norm-related questions were asked on a 7-point scale from strongly disagree (1) to strongly agree (7), except one question, “*If I follow food safety practices at work over the next 12 weeks, most people who are important to me would be...*”, which was asked on a (1) extremely unsupportive to (7) extremely supportive scale.

Data were collected until a minimum of 50 responses were received in both the high subjective norms and low subjective norms group. To screen for this, the question “*If I follow food safety practices at work over the next 12 weeks, most people who are important to me would be...*” was used. Anyone who responded with extremely unsupportive (1) to neither supportive or unsupportive (4) was classified with a low subjective norm, while those who responded with somewhat supportive (5) to extremely supportive (7) were identified with high subjective norms.

Part 2: In-Depth Open-Ended Questions

Qualitative Theory-Grounded

Theory-Grounded is a philosophical approach that focuses on what we perceive and experience, rather than on the reality of (Husserl, 2012a, 2012b). It focuses on the experiences of thinking, perceiving, and encountering the world (Moran, 2000). Because the cognitive process related with food safety behavior is transcendental, not empirical, the data of this study are generated from individual consciousness level on the conditions of possible behavioral action.

As a practice, the Theory-Grounded approach is particularly useful to describe various aspects of personal experiences, as discrete units of input (Husserl, 2012b; MacKinnon, 1993).

Theory-Grounded has been used as an essential methodology for neuroscience, cognitive science, and other domains that empirically study human consciousness (Husserl, 2012b; Moran, 2000). However, there is a lack of research conducted with food safety behavior. Thus, this study utilized Theory-Grounded phenomenology to qualitatively explore the observed and unobserved effect of food safety behaviors (Creswell, 2014). The details of open-ended questions are presented in Table 5.1.

Table 5.1. In-depth open-ended questions.

<i>Questions</i>
Q1. What type of foodservice operation are you working in right now? a) Quick service restaurant (Fast Food); b) Fast-casual restaurant (buffet, ice cream shop, deli); c) Dining hall (school foodservice, government, healthcare); d) Casual dining restaurant (family style); e) Full-service restaurant (Fine dining); e) Other, please specify _____
Q2. What roles do you play related to food safety within your organization? a) Bartenders; b) Cooks; c) Food preparation workers; d) Managers; e) Administration; e) Waiters and waitresses
Q3. What makes you successful in maintaining proper food safety at work?
Q4. What doesn't make you successful in maintaining proper food safety at work?
Q5. What beliefs do other employees have that prevent you from following proper food safety practices?
Q6. What beliefs do other employees have that encourage you from following proper food safety practices?
Q7. Do you believe that your peers or coworkers follow proper food safety practices? Please provide some examples?
Q8. Is it important to you that other peers or coworkers follow proper food safety practices? Please explain?
Q9. Is it important to you that the owners, managers, and/or supervisors follow proper food safety practices? Please explain.
Q10. Is it important to you that owners, managers, and supervisors follow proper food safety practices? Please explain.
Q11. What pressure do your supervisors use to encourage or discourage you to follow proper food safety practices?
Q12. What support or lack of support do supervisors provide that impacts your motivation to practice food safety?

Q13. Do you believe that the supervisors in your operation follow proper food safety practices? Please provide some examples.

Q14. What would you change about food safety practices within your operation?

Q15. What unique approaches have the supervisors in your operation used to promote proper food safety practices?

Q16. List **THREE** reasons to describe why you are expected to perform food safety.

Note: Responses are presented in the order listed above.

Part 3: Demographic Questions

Participants' demographic information was collected, including age, gender, and education level, part-time or full-time employment status, and a number of years they have been employed in the foodservice industry. Additional questions specific to foodservice operation were also gathered, which include whether participants were food safety certified, what type of restaurant or foodservice organization, and what current position the respondent worked for. These were documented as background factors to help with data analysis.

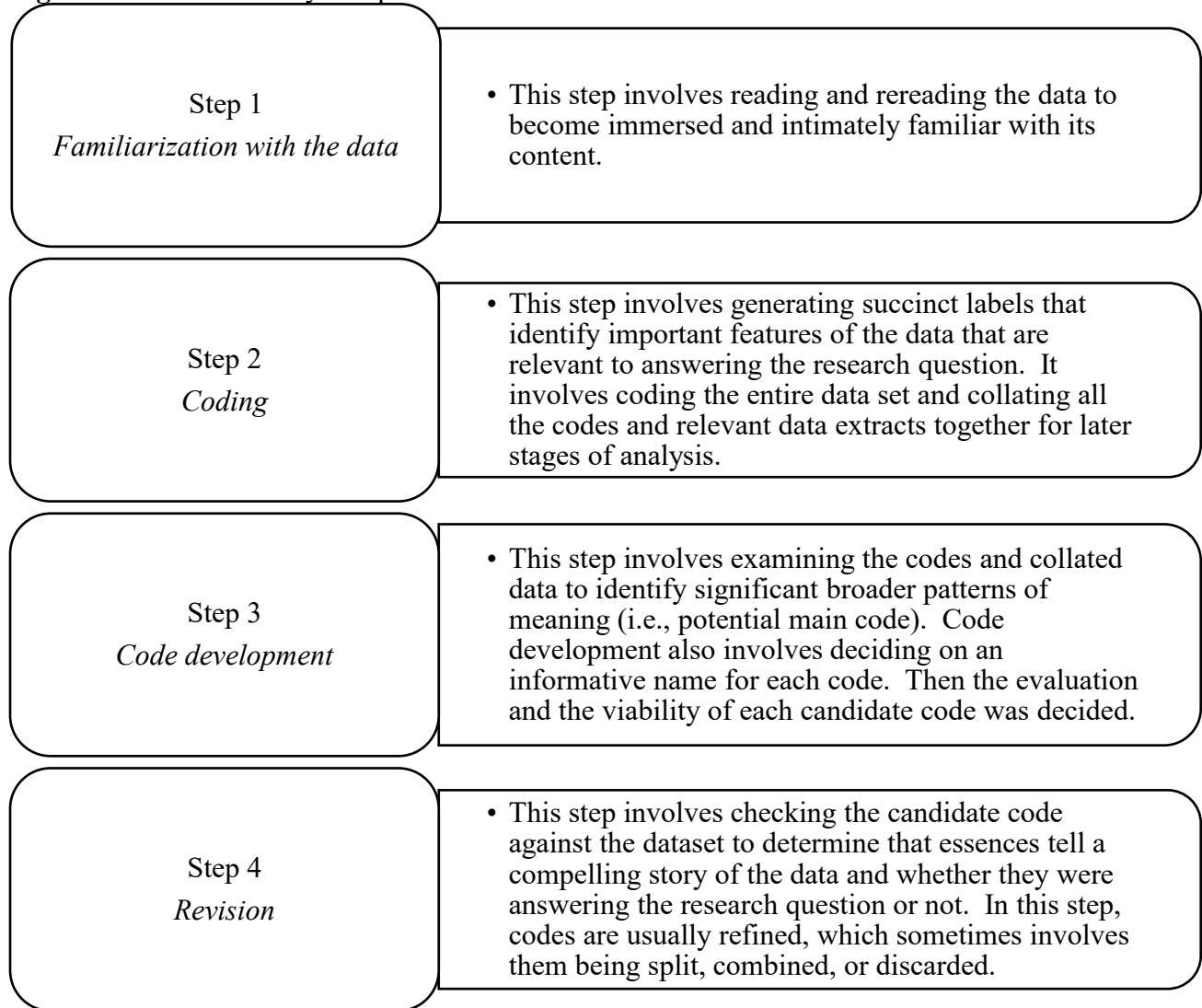
The Survey: Data Analysis

For the analysis of the quantitative part of survey questionnaire the Statistical Package for the Social Sciences (SPSS Version 21.0). Cronbach's alpha (Trochim & Donnelly, 2005) was used to determine to construct reliability among the normative measurement scales. A threshold of 0.70 was used to demonstrate consistency. Descriptive statistics were computed, and average means and standard deviations were reported.

Theory-ground phenomenology (Husserl 2012a; 2012b) provided the qualitative principles to guide the analytical process for part 2 of this study. A computer-assisted qualitative data analysis software ATLAS. Ti. Version 7.5 (Scientific Software Development: Germany) helped organize and secure the data. Initial codes were labeled and defined by consensus. The discussion and meeting resolved the code list, refinement, and discrepancies. Methodological notes during data collection were also used for analysis (Sandelowski, 2000).

This study employed an inductive method of descriptive analysis (Creswell, 2014), and diagram analysis (Gibbs, 2007) which are more circular in nature than linear (Arendt et al., 2012; Leiblich et al., 1998). The analysis procedure of the survey part of the qualitative inquiries can be summarized in Figure 5.2.

Figure 5.1. Circular analytical process.



Note: Adopted from Leiblich, A., Tuval-Mashiach, R., and Zilber, T. (1998). *Narrative research. Reading, analysis, and interpretation*. London, UK: Sage Publications.

Validity and Triangulation

The focus on criterion sampling helped validate the accuracy and meaningfulness of the survey data by using data from the screening phase. Cronbach's alpha was used to construct reliability among the quantitative measurement scales. The trends and patterns of the quantitative survey then served as the foundation for generating comparisons and baseline between the participants during the screening phase and the survey. Thus, the narrative contents

and coding process can provide a more detailed explanation with triangulation, which helps to enhance the rigor of the process and credibility of findings.

An audit trail that includes the method notes, survey texts, timing records, coding template, data analysis notes, and analytic memos (Birks, Chapman, & Francis, 2008) were developed in Atlas TI to establish credibility. Triangulation was established by going through the steps of the phenomenology analytical framework independently (Leiblich et al., 1998). Theoretical saturation was achieved when no further qualitative evidence was found (Sandelowski, 2000). Transferability was established with the use of purposeful sampling and a thorough description of the survey texts and analytic memos (Trochim & Donnelly, 2005). Finally, the writing of the report linked concepts to one another and construct the code structure with the phenomenon based on the data, then help establish a code structural model based on cognitive experiences from collective nonjudgmental perspective.

Results

Demographic Information

A total of 610 participants participated, after viewing the consent form and introduction of the questionnaire, a total of 494 participants dropped out of the survey. An additional six participants started the survey but didn't complete. The quota ensured low and high groups to have a minimum of 50 respondents. Additional coding resulted in six participants being disqualified due to intentional fraudulent responses in response (e.g. posting symbols or emojis). Therefore, after screening for volunteering dropouts and incompletes, a total of 104 completed responses (17%) were documented for coding. This included 92 who were identified as having

high norms, and because of those who were screened out, only 12 were identified as having low norms. The detailed descriptive profile of participants was listed in Table 5.2.

Most participants were female, with a mean age of 36 with a least a high school diploma, and ServSafe® food safety certification. Most of the participants are employed full-time in quick service restaurant, with an average of 11 years of foodservice industry experience.

Although a quota was used to ensure a minimum of 50 respondents from both low and high subjective norm groups, after purging false or incomplete responses, only 12 responses remained in the low subjective norm group, while 92 responses remained in the high subjective norm group.

Cronbach's alpha (Trochim & Donnelly, 2005) was used to determine to construct reliability among the normative measurement scales. A threshold of 0.70 was used to demonstrate consistency. Results indicated that all normative measurement had reliabilities that were preferable and are presented in Table 5.3. Overall, respondents indicated that they thought the normative pressure for food safety practices was important (6.54 ± 1.08) and supportive (6.44 ± 1.16), and most of the coworkers and managers follow proper food safety practices (5.90 ± 1.39).

Table 5.2. Characteristics of Participants ($n = 104$).

<i>Demographics</i>	<i>n</i>	<i>%</i>	<i>Employment information</i>	<i>n</i>	<i>%</i>
<i>Gender</i>			<i>Employment Status</i>		
Female	65	63.1	Full time	95	92.2
Male	32	31.1	Part time	2	1.9
<i>Age</i>			<i>Food Safety Certification</i>		
18 - 29	28	27.2	Yes, ServSafe certified	66	64.1
30 - 39	40	38.8	Yes, other certification	4	3.9
40 - 49	13	12.6	No, not certified	22	21.4
50 - 59	15	14.6	<i>Low Versus High Norms*</i>		
60 - 69	1	1.0	Low Norms	12	11.7
70 or older	0	0	High Norms	92	88.3
<i>Education Level</i>			<i>Years in the Industry</i>		
Some high school	3	2.9	Less than 1 year	13	12.6
High school graduate	32	31.1	1 – 2 years	8	7.8
Some college credits	34	33.0	2 – 5 years	19	18.4
Associate degree	13	12.6	5 – 10 years	15	14.6
Bachelor's degree	12	11.7	10 – 15 years	15	14.6
Graduate degree	2	1.9	15 – 20 years	14	13.6
<i>Type of Foodservice</i>			More than 20 years		
Fast food	32	31.1	<i>Job Title</i>		
Family-style or casual	25	24.3	Managers	24	23.3
Fast casual	13	12.6	Food preparation	18	17.5
Fine dining	13	12.6	Cooks	17	16.5
Other, i.e., bar, catering	12	11.7	Servers	12	11.7
Dining hall or school	2	1.9	Bartenders	7	6.8
			Administrations	1	1.0
			Other, i.e., baker, washer	18	17.5

Note: Responses may not equal 100% due to non-response to some of the demographic questions.

*Initial group quota ensured at least 50 respondents participated in each low and high group with a total of 59 respondents participated in the low group and 468 respondents participated in the high group.

Cronbach's alpha (Trochim & Donnelly, 2005) was used to determine to construct reliability among the normative measurement scales. A threshold of 0.70 was used to demonstrate consistency. Results indicated that all normative measurement had reliabilities that were preferable and are presented in Table 5.3. Overall, respondents indicated that they thought

the normative pressure for food safety practices was important (6.54 ± 1.08) and supportive (6.44 ± 1.16), and most of the coworkers and managers follow proper food safety practices (5.90 ± 1.39).

Table 5.3. Summary of Normative Measurement Scales ($n = 104$).

<i>Variables</i>	<i>Mean</i>	<i>SD</i>	<i>Reliability</i>
<i>Injunctive Norms</i>			0.868
1 ^a . Most people who are important to me would approve of me following food safety practices at work regularly over the next 12 weeks.	6.55	1.11	
2 ^a . Most people who are important to me would encourage me to follow proper food safety practices at work regularly over the next 12 weeks.	6.54	1.06	
3 ^a . Most people who are important to me would support me if I follow proper food safety practices at work over the next 12 weeks.	6.62	0.98	
4 ^b . If I follow food safety practices at work over the next 12 weeks, most people who are important to me would be ...	6.26	1.34	
<i>Descriptive Norms</i>			0.861
5 ^a . My coworkers will follow proper food safety practices at work regularly over the next 12 weeks.	5.80	1.40	
6 ^a . My boss or managers follow proper food safety practices at work regularly over the next 12 weeks.	6.00	1.37	

a Scale value ranges from *Strongly Disagree (1)* to *Strongly Agree (7)*.

b Scale value ranges from *Extremely Unsupportive (1)* to *Extremely Supportive (7)*.

Note: SD = Standard Deviation; Reliability = Cronbach's Alpha

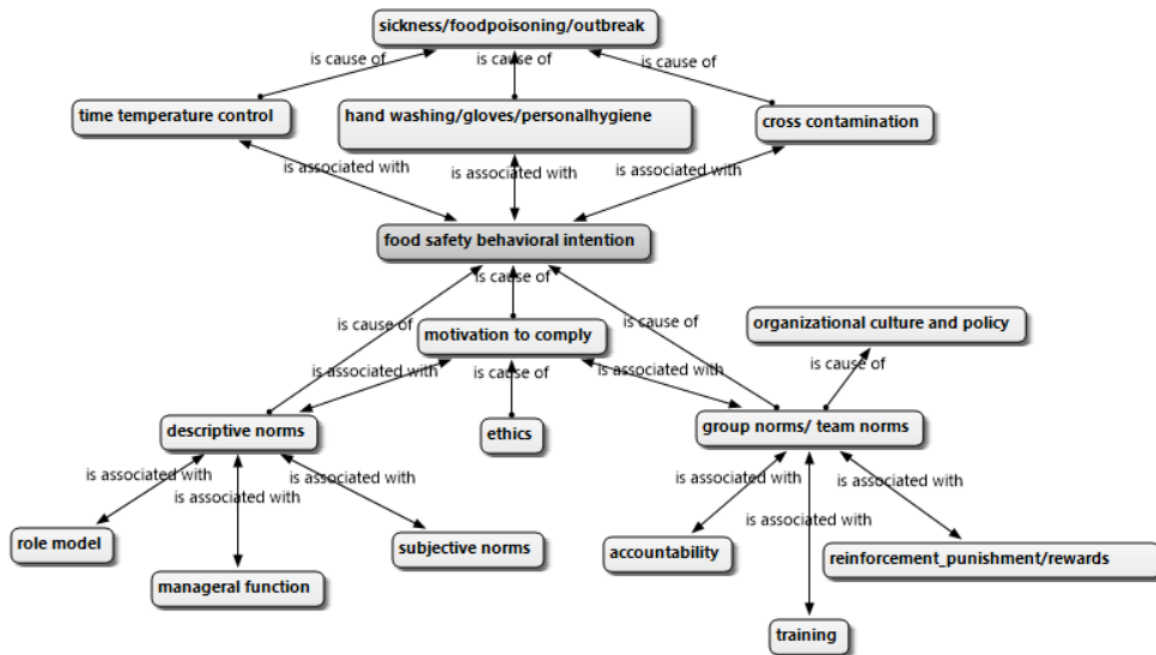
Overriding Themes and Narrative Content

The Code-Subcodes Diagram Visualization

Figure 5.1 represents the diagram analysis (Gibbs, 2007) with the overall structure of code and subcodes. The visual representation of the hierarchical structure of code and its subcodes in combination are illustrated in the Code-Subcodes Model. The direct subcodes were placed at a small distance, and a row underneath them are more distanced subcodes.

Overall, the code structure represented each question of interest, descriptive norms, group norms, and motivation to comply. Each main code tends to have a strong structure of subcodes supporting their code structure, therefore, form up overall normative beliefs and relative to form strong individuals' food safety behavioral intentions. The ethical recognition tends to cause the individual's motivation to practice food safety directly. Subcodes and their relevant structure also support relative group norms and descriptive norms.

Figure 5.2. Hierarchical Code-Subcodes Model



Theme 1: Moral Recognition and Intrinsic Motivation - Doing What is Right

According to Fishbein and Ajzen (2011), normative beliefs constitute the basis to form perceived social pressure. However, our data suggests employees in the foodservice industry are not influenced by what one's manager or coworker believes, but more directly from their innate beliefs, which would approve of him/her practicing food safety or not. One food preparation worker stated: *“Even if others don't believe in the proper food safety practices, I will not let*

anyone's opinion inhibit me from correct food handling [Female, 29].” Another chef specified *“None of my fellow employees’ beliefs will get in the way of what I am doing. I am the one driving the bus. Customer safety [ensures] everyone that comes through the door has faith in us and our abilities. Lastly, it's just the right thing to do [Male, 39].*” A manager from a fast food restaurant stated, *“Other employee’s beliefs don’t affect my own desire to follow food safety rules. I will regardless. But it is nice when someone is all about food safety as well [Female, 33].*” Another senior manager from a fast food restaurant stated, *“Other people's beliefs do not prevent me from following food safety practices. I have seen people get sick at other restaurants when food safety is not followed properly so I always follow approved safety procedures [Male, 32].*” Therefore, our data show that the beliefs-value formation is more of the retrospective formation, rather than a forward-looking expectance formation suggested by the TPB.

Specifically, the employees feel pressure to follow safe food handling practices because of their moral compass, then affects their personal normative beliefs. This finding challenges the path direction of the TPB (Ajzen, 1991), by noticing the antecedents of forming food safety norms should be for either ethical or moral reasons first, then comply with good motivations.

Our data noted some participants uphold a strong responsibility and ethics regarding customer safety. One server working in a fast-casual restaurant stated, *“Guests coming into a restaurant have faith and trust that their food is handled properly, because it is our job to. Not at this restaurant, but others, I have been trained to properly handle food and managers and guests expect nothing but the best for me [Female, 33].*” Another server stated, *“I don’t want to make anybody sick from the food I am serving to them [Female, 29].*” Most participants in the foodservice operation believe other individuals might have a strong opinion whether to comply and properly perform food safety, but ultimately, it is the innate opinion and genuine desire to

prevent foodborne illness that guides employee behavior, more than others imposing their beliefs on them. Therefore, based on the data, foodservice employees are intrinsically motivated to serving safe food by self-regulating their behavior.

Intrinsic motivation is defined as operations that are based on the innate, organismic needs for competence and self-determination (Deci & Ryan, 1985). Like one of the full-time food preparation employees working in casual dining restaurant stated, *“I have worked in foodservice for many years and have seen firsthand what can happen if food safety standards are not met, and I would never wish sickness or ill health on anyone. I also eat the food at the restaurant where I work, so it is important to me that my coworkers uphold those standards as well [Female, 35].”* With good moral reasons, employees form good baseline beliefs in the retrospective formation and further carry out their behaviors based on the retrospective normative beliefs. One of the restaurant shift-supervisors stated, *“I know that other employees sometimes say that it’s silly that we take so much time for food safety such as filling out the temperature log or checking food quality. But it’s important to explain to them that if we don’t check someone could get sick [Male, 39].”* Another female restaurant server noted, *“It’s important that my coworkers follow food safety practices for two reasons. One, I only make \$2.13/hour and if no one wants to come eat at my restaurant, that’s all I’ll make. Two, I eat there quite frequently and obviously don’t want food poisoning [Female, 35].”* Therefore, our findings argue that with good moral standards, and the recognition of ethical reasoning, the participant's motivation to comply with food safety practices were passively asserted and reinforced by internal motivation. Therefore, intrinsic motivation can serve as an essential antecedent to predict injunctive norms.

Theme 2: Descriptive Norms – What Others Do, Does Affects Us

It is important to distinguish the normative pressure between subjective norms (also called injunctive norms) and the beliefs whether others perform or not perform the behavior themselves (Cialdini, Reno, & Kallgren, 1990). Although most employees claim to be unaffected by normative beliefs, others' food safety behavior tends to have a substantial influence upon whether they want to follow the behavior or not. One senior-level supervisor stated, *“Sometimes they have some baseless beliefs that prevent me from following proper food safety, like they don't want to use fragrance for handwash, or sometimes don't want to use proper machine for certain works [Male, 49].”*

Although the participants stated peers' opinion related to food safety practices were unimportant, observation of what others do was important and strongly related to personal behavior, the behavior of those who were in a leadership position is especially important. One restaurant shift supervisor stated, *“I can say that the most important part is that the managers are following the proper food safety procedures because they enforce it to all the other employees. If managers aren't following the procedures the employees aren't going to follow it either [Male, 39].”* Another head cook noted, *“If you work in food and your managers aren't following the procedures then you can guarantee that none of the employees are. You have to set the example and make a high standard for others to follow [Female, 27].”* Good positive food safety behavior from leaders tends to have a strong influence on employees to follow suit. For example, one fast-food restaurant manager stated, *“Our owners must also follow food safety. For example, I had my owner and the kitchen one time preparing one of our new products and then went to taste the new product while still in the kitchen I had to direct him to the office to taste it. Like he said he forgot that he was on the floor and it was improper to eat there. My supervisor*

was welcomed that I corrected that in his operator, and he was not mad at me, he was welcomed that I was willing to correct him even though he was the owner and I was just a manager [Male, 32].

When it comes to descriptive norms, behavioral consistency is also important, what you say should agree with what you do. One food preparation worker in a delicatessen department stated, *“When others follow the same proper food safety practices it encourages me to continue doing the right thing. It makes me happy to know all of us employees are on the same page [Female, 29].”* Another cook from casual dining restaurant, with 15-years’ restaurant experience noted, *“When your coworkers aren't consistent [at food safety], these beliefs that prevent them from following proper food safety are that, they don't have to follow procedure when no one is looking. My other employees don't have beliefs that encourage me to follow proper food safety [Male, 38].”*

Others noted that inconsistency in the behavior or negative reinforcement of the normative beliefs tends to be perceived with exaggeration. *“There are a few managers that are there, though that do not show that they care [about food safety]. All they want to do is come in and talk and eat and complain about being there... It really stresses me out and makes me mad. [Female, 39].”* Another restaurant server stated, *“A lot of people are very lazy. Sometimes it's hard for me to keep up with doing things the proper way if I am the only one trying to do so [Female, 27].”* A food preparation employee working at fast food restaurant chain stated, *“Some do not but others do. I have seen them try to heat up food that has been left out all night and I would throw it away. I have seen the freezer in front for fries and hot wings and nuggets, the door was left open all night and they wanted to refreeze that stuff and use it. I threw it away. It made them mad but I'm not going to get anyone sick while I'm working [Female, 39].”* One

of the managers who work for fast food restaurant concluded that *“The biggest problem has been other employees not abiding by food safety regulations. Trying to get others to follow the law, or even bad management (training) has made me unsuccessful at doing my job [Male, 35].*

Theme 3: Group Norms - When Norms Becomes Culture

The belief, which the group will do the same behavior as an individual will do, constitutes the basis of stronger normative pressure than descriptive norms (Goldstein, Cialdini, & Griskevicius, 2008). Moreover, the observation of others' behavior does encourage the behavior, and further fine turns the group's culture and identity (Cialdini et al., 1990, Cialdini & Goldstein, 2004). One fast-casual restaurant manager stated, *“We can only be effective as a team if everyone follows these practices. My own efforts will not be good enough to protect customers if someone else does not do the same and someone might get sick [Female, 42].*

Other managers stress the importance of team effort and building a norm for the group. One restaurant supervisor with 25 years of foodservice experience stated, *“It important that all staff whether they are involved in foodservice know the rules and regulations in the kitchen. If we work as a team we are more successful... [Female, 39].”* Another manager from fast food restaurant chain stated, *“It is important that everyone follows food safety in the workplace. If everyone does not understand that food safety is important someone can get sick. Even if you are not assigned to the kitchen such as those younger than 18. They could still get someone sick if they are carrying a foodborne illness and do not realize it, so they must be trained in food safety as well [Male, 32].”*

Being the leader of the foodservice means you are the role model, and you set examples for others. Regarding food safety culture, the observation of important other's action, especially

the action of leaders, owners, and managers will affect strongly upon group's identity and culture (Belasco, 2014). The leader not only leads the individuals to act but also encourage others to act corresponding to the norm and culture (Fiske & Taylor, 2013). Like one of the managers from a casual dining restaurant stated, *"It is important because we are role models to all the employees that are there. If the employees see the management and/or owners doing their worst then the employees learn from their actions [Female, 39]."* One food preparation employee working at a fast food restaurant stated, *"They [managers] set an example. If they don't care, no one else will either. Team member will always do slightly less than the manager [Female, 32]."* Therefore, supervisors tend to have a stronger influence on norms than peers and crews.

It is important that frontline managers support of food safety practices. One fast food restaurant manager stated, *"I know from experience that [my] supervisors do fall of food safety. They come in and do random inspections for food safety, so they are required to keep up on both local and federal guidelines, so they are more aware of food safety regulations [Male, 32]."* It is also important that managers continue to monitor the operation. Another senior head cook stated, *"The unique approaches that we have are that they do line checks three times a day and sign off in a log book each day. They also make sure that proper sanitation buckets are on each station and have a team huddle daily [Male, 48]."*

To build a positive norm for food safety culture, the organization and upper management need to be consistent and supportive. One manager stated, *"They [upper management/supervisors] are the top of the chain and tend to be more apt to be aware of how important food safety is, so I know that they adhere to the policy is more strictly than most managers [Female, 25]."* Another manager from fast food restaurant chain stated, *"We have monthly corporate inspections, accountability from management and other co-workers. Managers are Serv safe"*

certified. Sometimes however time constraints, or the need to save on food cost, [we] will have them saying something completely the opposite [Female, 32].”

Group norms provide the basic building blocks of interaction, which are necessary for the group to function (Fiske & Taylor, 2013). Therefore, some managers stated the importance of supervisor support. One restaurant manager stated, *“[Our] supervisors give us full reign to enforce food safety. Even though I'm currently just a crew trainer. I have the directive to speak with my crew about food safety and how it affects our store on a daily basis. If I need to I have the right to speak to the manager, so they can enforce the rules were directly with the crew member since I do not have disciplinary action rights [Male 32].”*

However, not all restaurant managers express positive experiences. One manager currently working at fast food chain restaurant stated, *“[Some managers] not caring in the service we provided and not caring if the foods were properly cooked. If people are there to play around for just a paycheck and not prepare quality foods, then it reflects on others there as well [Female, 32].”* Another restaurant manager stated, *“My supervisor or bosses lack much motivation they do more harm than good with the comments they make and the attitude they show towards me [Male, 30].”*

When norms are constantly violated and the food safety culture are not in place, the company policies became less effective. One restaurant supervisor stated, *“I worked at ... last year for the entire year and though the company was trying to implement new standards and policies, including TMTP [online training platforms] management was not up to par. Those policies and procedures would be enforced for about a week on and a week off depending on how the managerial crew felt physically. Hands were not being washed. proper temperatures for hot/cold products were not being monitored or were being completely ignored. I also was*

discouraged to see not only the crew but managers picking food off the fryer area or back line and eating it throughout the day [Male, 35].” It is also important to note that food safety culture often reflects collective attitudes and beliefs from an organization.

Discussion

The purpose of this study was to identify and explore the normative belief constructs related to predicting employees’ food safety behavioral intentions. Specifically, the inquiry explored the traditional expectancy-value formation of injunctive norms and the descriptive norms that contributed to the overall normative pressure to influence food safety behavior.

The earlier development of the TPB theory defines subjective norms as the perceived social pressure to engage or not to engage in a behavior (Ajzen, 1991). The definition is broad and did not distinguish normative beliefs regarding injunctive norms or the descriptive norms. Our data suggest the differences between the two constructs is identifiable in term of food safety management. As most participants stated, they are not affected by others’ opinion of them performing proper food safety practices or not. However, most participants gained strong pressure related to the observation of other’s food safety practices, which in turn does affect their attitude and evaluation of the behavior themselves.

The results noted that a positive or negative evaluation of observed food safety behavior has a corresponding effect on the observer towards the cause of their behavior, evaluation of the group norms, and understanding of the organizational culture. The behavior of leaders tends to be the most influencing character regarding descriptive beliefs and their relative conformity to the organizational culture. Support of upper management and behavioral consistency tend to be the other two antecedent constructs that are relatively important to descriptive norms. The

finding concludes the suspicion that descriptive norms have a strong influence on individual food safety behavior. The result is also congruent with previous literature from social psychology that the observation of other's action, especially by leaders or significant characters (i.e., managers/owners), tends to have a stronger influence on an individual's action (Fiske & Taylor, 2013). The results further confirm the findings from the previous meta-analysis that individual norms are an important antecedent to predict food safety behavioral intention.

However, descriptive norms within food safety management do have their own characteristics. The data noted that the negative reinforcement of food safety behaviors tends to have a great influence, which in turn can violate group norms and corrupt corporate cultures. For example, the policies of the company become less effective when norms are constantly violated. The results correspond to the previous literature of motivation, which argues that negative reinforcement is more noticeable (Shrauger & Rosenberg, 1970). With the support from the more recent study (Schmid, Staub, & Lin, 2018), when group norms are constantly violated, which can increase the likelihood of a negative behavior being repeated by other correspondents of the group.

Regarding our findings, the data from this study noted the aversive effect of descriptive normative pressure is strong, regarding food safety practices. Some of the participants expressed an overwhelmingly negative experience regarding some company cultures, where food safety norms are constantly violated. One explanation of this phenomenon is that employees tend to avoid or escape adverse or unpleasant stimuli resulted from displacement. For example, our data shows that the participants used different languages when describing their current working scenarios. Specifically, the participants used "*there*" instead of "*here*," "*others*" instead of "*us*" to distance themselves from those they describe who violate proper food safety practices. This

helps to solve individual discrepancies by putting a barrier between their own working environment and the negative norm culture. It is also worth noticing that negative group norms have the potential to disturb the order, thus making future orders less effective. Data from the participants also noted the dysfunctional organizational cultures make the company policies less effective or difficult to implement.

Another important finding involves the discrepancies between the expectancy-value formation with the access and measure of the individual level subjective norms. According to the TPB, the individual-level subjective norms should be measured using individual-level normative beliefs with the aggregation of motivation to comply (Ajzen, 1991). However, based on this data, employees in the foodservice industry are not influenced by the approval or disapproval of their managers' opinion, nor their co-worker's attitude about their behavior, but are more influenced by their innate motivation about ethical considerations and moral reasoning.

The traditional path direction of accessing injunctive norms follows the equation $\sum_i nb_i bc_i$ (Fishbein & Ajzen, 2011). While the qualitative data noted that participants experience high pressure from their peers and supervisors (injunctive norms), our findings challenge the path direction and agree with Stern (2000) who noted that normative beliefs were affected by the already established personal beliefs based on personal morals or reasons. Thus, this study suggests that injunctive norms relative to following safe food handling practices follow a retrospective formation rather than a forward-looking formation.

The results also noted that employees' intrinsic motivation would be an important antecedent construct and an important relay towards accessing individual level norms and overall normative pressure. Intrinsic motivation is based on innate needs rather than external influences. Previous literature has found that when people internalize their motivations, the motivation tends

to hold for extended periods of time and becomes an important premise for their long-term achievement (Davey, Sterling, & Field, 2014). Hence, to form higher-level normative beliefs about food safety practices at work, employees need first to find strong moral reasoning related to serving safe food, then internalize their goals to form strong intrinsic motivation. Therefore, the question of normative pressure has become the question of natural morality. Whereas each person's cognition of food ethics and personal moral standards passively affect their intrinsic motivation, which then constitutes their personal normative beliefs and their expression of pressure to perform food safety practices.

Limitations and Future Research

The TPB has frequently received criticism. Sniechotta, Pesseau, and Araújo-Soares (2014) concluded that the TPB had not shown the consistent prediction of behavior, thus calling upon the theory to be retired. Others rebutted, saying most of the studies fail to adapt the effects of other important constructs (Ajzen, 2015; Conner, 2015). Therefore, it is important to note the limitation of the theory, the behavioral intention gap, and its application toward improving future food safety practices.

Another limitation involves the qualitative sampling and analyses being used in this study. The qualitative analysis strategy with two parts of data funneling often results in a recursive process, which refers to the participants moving back and forth between the contents and becoming more familiar with the material and intended outcomes of the study, also known as circular analysis (Kriegeskorte, Simmons, Bellgowan, & Baker, 2009). This bias can affect results, and make participants appealing to the investigator's desire. Although, the funneling sample strategy can help with validation and accuracy. Future researchers should strive to

shorten parts of the data collection process or use double-blind methods to control for confounding factors.

One of the measurement limitations is the open-ended questionnaire process via the internet. The inability to capture the nonverbal language of the participant is a limitation. However, the internet does provide anonymity and privacy. Therefore, future researchers should consider the advantages and disadvantages of using internet collection and proceed with caution. Future researchers could consider using anonymous facial filters (e.g. Snapchat facial filters), which offer the ability to use the filters to disguise identity but retain nonverbal body languages and facial expressions to improve the qualitative interpretation further. Another limitation is that most of the participants are English-speaking females, which does not include minority foodservice population in the United States. Future research could consider using different languages to collect data.

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Chapter 6 - Summary and Conclusions

The purpose of this dissertation was to identify and explain the unobserved cognitive process within food safety behavioral intention, which is not necessarily captured by variables that are preconceived by the researcher from existing empirical studies and specified by existing theory. This project helps achieve the explanatory goal by first conducting a systematic review and meta-analyses (Study 1) with existing literature to better quantify the statistical power and summarize the effect sizes of conflicting studies. Then, qualitative data (Study 2) were collected to help explain the statistical results in-depth. Using existing observed cognitive variables, grounded by the Theory of Planned Behavior, the key idea is that our qualitative inquiry directly builds on the quantitative results (Creswell, 2014). Thus, the combination of the results from two parts of this dissertation can help improve the existing understanding of the theory and their specific application toward food safety. This dissertation discussed the strength and limitations of existing behavioral theory, in hope to increase explained variance of predicting food safety behavioral intention, and ultimately encourage the food safety practices being followed. The purpose of this chapter is to summarize the important findings identified in each study of the project, discusses theoretical and practical implications, clarify the limitations, and directions for future research.

Summary of Research

Behavioral resistance and failure to comply with proper food safety practices are both widespread and problematic (Roberts et al., 2008, 2009; Roberts & Barrett, 2009, 2011). This behavioral resistance has encouraged foodservice researchers over the past decade to examine the gaps of food safety knowledge and actual work-related food safety behavior (Arendt, Paez, &

Strohbehn, 2014; Roberts et al., 2008) so that evidence of effective food safety training or improvements of post-training behavior can be recorded. Previous literature suggests that exploring behavioral-based food safety training and developing domain-specific food safety-related behavioral theory may be an important direction for future research (Angelo et al., 2017; Howes et al., 1996; Kwon et al., 2012; Roberts et al., 2008).

To facilitate an understanding of the gaps between knowledge, training, and behavior, thoroughly summarizing previous studies results on knowledge-behavior dissonance in the food and nutrition context is needed (Ong, Frewer, & Chan, 2017). However, a systematic review related to explaining food safety behavior and their cognitive process is sparse in the existing literature. Moreover, most of the current reviews were narrative, did not address the bias that may be present in the reviewed literature, and dates back more than ten years.

The Theory of Planned Behavior (TPB) is one of the most fundamental and influential theories of behavioral change (Sheeran, Harris, & Epton, 2014; Sheeran & Webb, 2016). The TPB used behavioral intention as the immediate mediator before the prediction of actual behavior. To date, most of the TPB study accounted for 27% and 39% of the variance in behavior and intention, respectively (Armitage & Conner, 2001). However, a large proportion of variance within behavioral intention is still unexplained (Sheeran, 2002; Sheeran & Webb, 2016). The collective information suggests there are roles for other predictor variables and room for improvement (Sheeran & Webb, 2016).

To help improve behavioral theory related with improving food safety behavior and behavioral intention (Arendt et al., 2014; Song et al., 2010), this dissertation used an explanatory sequential mixed methods design (Creswell, 2014), which involved both quantitative and qualitative data collection, and sequentially investigated the results in-depth with enriched

qualitative explanation of the numerical data and guide future research and theoretical development of the field. The fundamental idea is that the qualitative data collection builds directly on the quantitative results. Therefore, the purpose of this project was to identify and explain the unobserved cognitive process within food safety behavioral intention, which includes a meta-analysis of 46 records (Chapter 4) and a qualitative explanatory study with 104 participants (Chapter 5). The combination of the research was used for validation of existing theory, exploring new constructs, and developing and improving behavioral theories within food safety management.

The specific research questions for the meta-analysis (study 1) were to (a) evaluate construct relationships between attitude, subjective norms, and perceived control on food safety behavioral intention among foodservice employees using a random-effect model; (b) test contextual variables using gender, age, and work experience as moderators of the relationship between attitude and intention, subjective norms and intention, and perceived control and intention; (c) identify influential outliers considered in observed effects between food safety attitude, subjective norms, and perceived control to food safety behavioral intention. The specific objectives for the qualitative study (study 2) were to (d) identify the main factors that affect the descriptive beliefs of individual foodservice employees; (e) recognize the main factors that affect the normative beliefs of individual foodservice employees; and (f) evaluate the share believes in the group that affects the food safety practices of individual foodservice employees. Summaries of significant findings in the qualitative and quantitative studies are presented below.

Quantitative Study: Systematic Review and Meta-Analysis

The electronic boolean operator search and manual journal search were conducted in March 2018. A total of 1,539 studies were identified and screened, after coding all included studies, a combination of 46 study relationships was recorded with 19 food safety attitudes to intention correlations, 13 subjective norms to intention correlations, and 14 perceived behavioral control to intention correlations. The systematic review and meta-analysis provide strong evidence to support the utility of the TPB, and its application to predicting food safety behavioral intentions.

Research Question 1: Do attitude, subjective norms, and perceived control have a significant random-effect on food safety behavioral intention among foodservice employees?

Using a random effect size model, the overall combined effect size of the TPB constructs predicts food safety behavioral intention, with a positive and significant relationship ($\overline{ES} = 0.282, p < 0.001$). The weighted average correlation from each independent variable ranged from 0.247 to 0.370, with medium to large effect sizes. The results are similar across all different food safety behaviors, as the total between study variance and heterogeneity ratio using the random effects model was low and not significant. Therefore, the results noted that although food safety practices were conducted in various working and service environments, the cognitive process of individual employees to food safety behavior tends to be similar between studies. Overall, this meta-analysis verified and confirmed the comprehensive functionality of using the TPB to improve food safety behaviors within foodservice domains.

The results indicated that subjective norms tend to be the most important construct regarding identifying and predicting food safety behavioral intentions, compared to other variables within the TPB. One possible explanation could be subjective norms are strongly influenced by the specific individual, who might approve or disapprove of the specific food safety practices (Ajzen, 1991). More specifically, the observation of others' action, by leaders or by other employees, might intensively fine tune individual norms, which impacts the individuals' personal beliefs about whether to perform food safety practices themselves. Another possible explanation is the group norms, where the group tends to have shared beliefs about food safety behaviors. Studies with a large sample tend to have significantly stronger individual subjective norms. Thus the group encourages others to act correspondingly to the group's culture and identities.

Research Question 2: Do gender, age, and work experience moderate the relationship between attitude and intention, subjective norms and intention, and perceived control and intention?

A series of multi-meta regressions were conducted using food safety behavioral intention as a dependent variable to determine the influence of age, gender, and years of work experience as moderating variables on study effects. The proposed moderating variables, age, gender, and years of work experience did not significantly moderate the study relationships between attitudes, subjective norms, perceived behavioral control to food safety behavioral intention. Although all VIF is less than 10, the F -value is small ($F [3, 18] = 1.39, p = 0.277$). One possible explanation could be caused by the missing data within the included studies. Although, most studies ($k = 22$) reported demographic variables, a portion of the included studies did not

measure any demographic information, (e.g., Clayton & Griffith, 2008; Seaman & Eves, 2010), which meant that the case must be deleted, thus diminishing the significance of the multi-meta regression test. All corresponding authors, whose studies were missing demographic data, replied and confirmed the lack of demographic information. Therefore, future researchers are strongly encouraged to collect demographic data.

Research Question 3: Are there any influential outliers consider in observed effects between food safety attitude, subjective norms, and perceived control to food safety behavioral intention?

The results indicated that subjective norms tend to be the most influential construct regarding identifying and predicting food safety behaviors, compared to other variables within the TPB. The results noted that Roberts and Barrett's (2011) subjective norms were considered as the most substantial outlier compare to average effect sizes that were collected in the review, which had an outstanding positive effect size among all 46 study effect sizes (*Studentized residuals* = 2.34, *DFFITs* = 1.92). Restaurant managers tend to have a stronger than normal subjective norms to intention relationship regarding offering food safety training to employees. Restaurant or foodservice managers usually have a plethora of responsibilities related to food safety practices, thus feel stronger intention to provide food safety training to their employees. Additionally, restaurant managers are more likely to evaluate the opinions of crew members and colleagues regarding forming a good support for food safety training.

Qualitative Study: Open-Ended Questions

A criterion based open-ended questionnaire with employees in the foodservice industry was distributed to explore food safety behaviors. A total of 104 participants were enrolled. The following section summarizes the significant findings to answer research questions.

Research Question 4: What are the main factors that affect the descriptive beliefs of individual foodservice employee?

The data recorded that a positive or negative evaluation of food safety behavior (descriptive norms) have a positive or negative normative effect on the observer towards the cause of their own behavior. Overall, the behavior of leaders was noted as an influencing character in term of descriptive norms and their relative conformity to the organizational culture. The *support of upper management* and *behavioral consistency* tends to be important antecedents that are relatively important to descriptive norms. The results were congruent with previous literature from social psychology that the observation of other's action, especially by leaders or significant characters (i.e., managers/ owners), tends to have a stronger influence on individual's action (Fiske & Taylor, 2013).

The results from Study 2 further enriched and confirmed the findings from Study 1, which indicate individual norm are an important antecedent to predict food safety behavioral intentions. The data also noted that descriptive norms have a strong influence on individual food safety performances, with negative reinforcement of food safety descriptive beliefs having a stronger influence than positive descriptive beliefs. Thus, if not managed, tends to post threats to food safety culture and constitutes negative group norms within the operations. In addition to negative reinforcement, the findings also noted the aversive effect of descriptive normative

pressure within food safety practices. Whereas, the participants tend to displace negative normative experiences with exaggeration and use language that distance themselves from experience. It is noted that when participants experienced negative experience regarding food safety practices, employees tend to avoid or escape adverse or unpleasant stimuli. Future research should investigate the aversive effect of descriptive normative pressure, which disturb the moral order and positive food safety culture.

Research Question 5: What are the main factors that affect the normative beliefs of individual foodservice employee?

Our findings suggest that employees in the foodservice industry are not influenced by the approval or disapproval of peers or managers related to their food safety behavior. The data further noted that participants' utilization of proper food safety behavior was more of an innate motivation for ethical consideration and moral reasoning. Thus, the findings suggest that *intrinsic motivation* would be an important construct of the investigation, and the construct of food safety normative beliefs should be based on the innate, inherent needs, rather than relying on external pressure. Previous literature also noted the process of motivation to comply becomes stronger when participants internalize their motivation (Deci & Ryan, 1985). Therefore, future study should investigate employee's moral cognition and intrinsic motivation, which affect or assert on their normative beliefs related to food safety practices.

According to the TPB theory, it is important to access and measure the individual level normative beliefs and motivations first, then aggregated into individual level subjective norms using expectancy-value formation (Ajzen, 1991). Contradictory to the existing understanding of the theory, our finding suggests the path direction is reversed. The study results supported a

retrospective formation of subjective norms, rather than theory suggested forward-looking expectance formation regarding predicting food safety subjective norms. Therefore, future researchers should reinvestigate the path direction and the process of motivation regarding food safety practices.

Research Question 6: What are the shared beliefs in the group that affects the food safety practices of individual foodservice employee?

The results noted the approval or disapprove of peers' opinion related to food safety practices were unimportant. However, our data noted that the observation of others' behavior was important influence to their behavior. Moreover, the observation of leaders' food safety behavior, especially by owners and managers, can become an important motivation for others to follow suit, or seek conformity towards group's culture and identity. The data noted, leaders are role models, and a consistent form of reminder and pressure for employees to follow suit. Role modeling is congruent with other literature that the observation of others' behavior does assert normative pressure toward our behavior, often known as empowering norms or leadership's motivation (Cialdini et al., 1990, Cialdini & Goldstein, 2004).

Moreover, the norms provide the building blocks for the group to function and constructs shared beliefs, which fine turn the group's culture and identity. Other researchers argued that group norms and shared beliefs have a much stronger influence on behavior and conformity than individual descriptive norms (Goldstein, Cialdini, & Griskevicius, 2008). Thus, future researchers should distinctively compare the constructs and boundaries to clarify the differences further.

The study results also suggest that it is important for employees to find consistency from their observations. Positive professional food safety behavior from peers is important for the cohesion of their beliefs. For example, employees establish positive food safety beliefs from their training and employee handbook, but observations from their leaders' behavior can post inconsistency towards their already established beliefs, causing cognitive dissonance. A successful operational example would be from leaders, who can display food safety-related skills, techniques, career commitment, and relative professional behavior towards food safety practices. This is often referring to as positive reinforcement or successful leadership behavior (Lockwood, 2006). Besides positive reinforcement, the data noted that negative reinforcement is perceived more evidently. Some of the participants expressed an overwhelmingly negative experience regarding some company culture. When norms are constantly violated, the employees tend to displace with avoidance behavior and cause them to escape from unpleasant stimuli or working scenarios. Therefore, future researchers should also study dysfunctional organizational culture in compensating to current food safety culture studies to examine how group norms are violated and the effects of negative normative experiences.

Implications

Extant literature has revealed a dissonance between food safety knowledge, attitudes, beliefs, and actual food safety practices. Therefore, thoroughly integrating previous studies and examining the behavioral theory within foodservice context is needed (Ong, Frewer, & Chan, 2017). However, current behavioral theory within food safety tends to show conflicting results and fails to predict and elucidate actual food safety behavior. Thus, this dissertation was

conducted to help discover the unexplained variance within food safety behavioral intention and ultimately improve food safety behavior and practices.

Theoretical Implications

This project has several theoretical contributions. First, Study 1 helped quantify the observable heterogeneity ratio of behavioral intention from a collection of literature using effect sizes. The researcher discovered a similar cognitive behavioral structure that is indifferent to the supposedly multicultural multigenerational foodservice populations. Regardless of the differences in people, the cognitive process of forming food safety behavioral intention tends to be coherent, with identifiable cognitive paths, constructs, and relationships. Thus, a domain-specific food safety behavioral theory remains feasible through the integration of new contextual variables, moderating new path structures, and uncovered cognitive processes.

Study 1 reported subjective norms tend to be the most important construct regarding identifying and predicting food safety behavioral intentions. Compared to other cognitive variables, normative influences tend to have had a significant relationship regarding explained variances and improved prediction of the intentions. Study 1 results also reported significant outliers within the examined theoretical constructs, which can be an interesting investigation for future researchers.

Study 2 helped examine the normative influences by adopting a qualitative method that investigated both injunctive and descriptive norms through current foodservice employees' personal experiences. Through the explanatory qualitative procedure, additional post hoc data-driven antecedents were identified and discussed. Specifically, intrinsic motivation, individuals' moral cognition, and moral reasoning tend to be an important construct to form food safety-

related injunctive norms. Moreover, organizational support and managers' behavioral consistency and role modeling behavior are strongly relevant with individual norms. A strong individual normative belief can help construct positive shared beliefs norms and food safety culture within the foodservice organizations.

Collectively, this project has used an explanatory-sequential mixed-methods design, which involves both quantitative and qualitative data collection, and the subsequent study are built directly upon previous study results. The results help identify variables that are specific to foodservice operations, which are not necessarily involved in the existing theories, thus help disclosure opportunities for future investigations. One of the main contributions of this project is the using of evident constructs from existing theories and explored the unobserved heterogeneous structure using mixed inquiries. With the utilization of evidence discovery procedures (Creswell, 2014), the results of the study help identified potential domain specific variables and new path relationships for investigations. The results of this project attempt to improve the explained variances in food safety behavioral intention, by focusing on a normative-intention relationship which helped to plan future investigations related to food safety culture and shared beliefs. Future studies can plan an intervention experiment to confirm the results discovered within this project. With prudence, the food safety behavior and practices within the foodservice industry can be improved.

Practical Implications

Government authorities often rely on high-quality systematic reviews to update policies and regulations and provide best practice guidelines for industry (Dixon-Woods et al., 2006). The meta-analysis provided high-quality evidence in a holistic fashion, which helps summarize

conflicting study results, identifying the observed heterogeneity ratio, and generating new hypotheses based on collective justifiable evidence from multiple studies.

Regarding improving food safety practices, qualitative evidence helped to explore and explain complex and dynamic food safety scenarios. The results of the qualitative study helped us understand employees' experience and related to developing strong theories towards effective practices. The qualitative data that incorporated the meta-analyses results help discern and describe social influences and phenomenon related to food safety behavioral intention and organizational culture. Specifically, the data helped identify effective intervention agents, which might suggest cost-effective food safety training strategies. The empirical experience extracted from managers and employees can be used to revise and improved industry operational guidelines that serve as important updates for foodservice managers. Another practical implication involves researchers using multi-methods, thus help resolved anomalies in the data, especially the discussion involved control beliefs and its relative importance towards understanding psychological barriers related to food safety practices.

Limitations and Recommendations for Future Research

One of the main limitations of this study was the language used, as it only includes English for both studies. Although other languages can be translated and included, the lack of compatibility related with library indexing system for meta-analysis, and population structure of existing panels for qualitative studies posed a technical difficulty to conduct a multicultural investigation. Future research should consider using different languages with minority populations and differentiating large operations from those that are smaller.

Starting the investigation from the TPB has its own limitations. The TPB has frequently received criticisms from other researchers (Sniehatta et al., 2014). The conclusion is being rebutted, but using only behavioral intention to conclude direct behavior tends to ignore the important behavior-intention gap. Future researchers should duplicate the study procedure using different behavioral theories to see if the results differ, or any new variables being concluded.

Another technical difficulty includes limited access to insignificant findings or studies that are contradicting to the popular understanding may often go unpublished due to publication biases. Thus, this project would potentially be biased due to the lack of access to the unpublished data. Some of the mathematical calculations used in the project were less precise than using the original datasets, as the statistics computation often evened out due to journal requirement or formatting guidelines.

Another limitation related to sampling involves the social desirability bias. Although the study adopted a funneling sampling strategy, which can help control the biases but only to a limited degree. Future researchers should strive to use a double-blind method or use randomized response technique to control for confounding factors.

At last, this project was conducted in a relatively short period, and the current instruments used are vulnerable for the common method biases. Future researchers should consider using longitudinal study and repeated measure design to control for common method biases.

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Appendix A - Kansas State University IRB Approval and Modifications

TO: Dr. Kevin Roberts
Hospitality Management
152 Justin Hall

Proposal Number: 9234

FROM: Cheryl Doerr, Associate Vice President of Research, Compliance
University Research Compliance Office



DATE: 04/04/2018

RE: Proposal Entitled, "Explaining unobserved heterogeneity of food safety behavior: A sequential mixed method approach"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written - and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

TO: Dr. Kevin Roberts
Hospitality Management
152 Justin Hall

FROM: Rick Scheidt, Chair 
Committee on Research Involving Human Subjects

DATE: 09/25/2018

RE: Proposal #9234.1, entitled "Explaining unobserved heterogeneity of food safety behavior: A sequential mixed method approach."

A MINOR MODIFICATION OF PREVIOUSLY APPROVED PROPOSAL #9234,
ENTITLED, "Explaining unobserved heterogeneity of food safety behavior: A sequential mixed
method approach"

The Committee on Research Involving Human Subjects at Kansas State University has approved the proposal identified above as a minor modification of a previously approved proposal, and has determined that it is exempt from further review. This exemption applies only to the most recent proposal currently on file with the IRB. Any additional changes affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Unanticipated adverse events or problems involving risk to subjects or to others must be reported immediately to the IRB Chair, and / or the URCO.

It is important that your human subjects project is consistent with submissions to funding/contract entities. It is your responsibility to initiate notification procedures to any funding/contract entity of changes in your project that affects the use of human subjects.

Appendix B - Open-Ended Questionnaire

Dear Respondent,

We are exploring restaurant employee's intention about food safety practices. The purpose of this study is to help increase the understanding of how social influence affects food safety practices. Your responses are critical to the success of the study. It should only take you approximately 16 minutes to complete this survey.

Your participation in this research is strictly voluntary. Refusal or stop participating at any time will involve no penalty. Submission of a completed questionnaire indicates your willingness to participate. All survey responses will remain anonymous. No individual responses will be reported and only aggregate responses will be used. There are no risks associated with your participation in this study. The Committee on Research Involving Human Subjects at Kansas State University has approved this study (IRB # 9234). For questions about your rights as a participant, or the way the survey is conducted, you may contact me at nlin@k-state.edu or Dr. Rick Scheidt, Chair of the Committee on Research Involving Human Subjects, (785) 532-3224, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506.

We appreciate your time and effort in taking part in this study.

Cordially,

Naiqing Lin, M.S.

Graduate Student

Kevin R. Roberts, Ph.D.

Associate Professor

Section I: General Questions

QV1. Do you agree to participate in this survey?

Yes

No

QV2. Are you currently a restaurant/foodservice employee?

Yes

No

QV3. Are you currently living in one of the fifty states of the United States?

Yes

No

QV4. I think that if I follow food safety practices at work over the next 12 weeks, most people

who are important to me would be ...

Extremely supportive

Unsupportive

Somewhat unsupportive

Neither

Somewhat supportive

Supportive

Extremely supportive

QV5. Most people who are important to me would: approve me if I follow food safety practices

at work regularly over the next 12 weeks?

Strongly disagree

Disagree

- Somewhat disagree
- Neither
- Somewhat agree
- Agree
- Strongly agree

QV6. Most people who are important to me would: approve me if I follow food safety practices at work regularly over the next 12 weeks?

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither
- Somewhat agree
- Agree
- Strongly agree

QV7. Most people who are important to me would: encourage me if I follow food safety practices at work regularly over the next 12 weeks?

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither
- Somewhat agree
- Agree
- Strongly agree

QV8. Most people who are important to me would: support me if I follow food safety practices at work over the next 12 weeks?

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither
- Somewhat agree
- Agree
- Strongly agree

QV9. Boss or managers follow food safety practices at work regularly over the next 12 weeks.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither
- Somewhat agree
- Agree
- Strongly agree

QV10. Friends or peers follow food safety practices at work regularly over the next 12 weeks.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither
- Somewhat agree

Agree

Strongly agree

Section II: Food Safety Practices

Q1. What type of foodservice operation are you working in right now?

- a) Quick service restaurant (Fast Food);
- b) Fast-casual restaurant (buffet, ice cream shop, deli);
- c) Dining hall (school foodservice, government, healthcare);
- d) Casual dining restaurant (family style);
- e) Full-service restaurant (Fine dining);
- f) Other, please specify _____

Q2. What roles do you play related to food safety within your organization?

- a) Bartenders;
- b) Cooks;
- c) Food preparation workers;
- d) Managers;
- e) Administration;
- f) Waiters and waitresses

Q3. What makes you successful in maintaining proper food safety at work?

Q4. What doesn't make you successful in maintaining proper food safety at work?

Q5. What beliefs do other employees have that prevent you from following proper food safety practices?

Q6. What beliefs do other employees have that encourage you from following proper food safety practices?

Q7. Do you believe that your peers or coworkers follow proper food safety practices? Please provide some examples?

Q8. Is it important to you that other peers or coworkers follow proper food safety practices? Please explain?

Q9. Is it important to you that the owners, managers, and/or supervisors follow proper food safety practices? Please explain.

Q10. Is it important to you that owners, managers, and supervisors follow proper food safety practices? Please explain.

Q11. What pressure do your supervisors use to encourage or discourage you to follow proper food safety practices?

Q12. What support or lack of support do supervisors provide that impacts your motivation to practice food safety?

Q13. Do you believe that the supervisors in your operation follow proper food safety practices?

Please provide some examples.

Q14. What would you change about food safety practices within your operation?

Q15. What unique approaches have the supervisors in your operation used to promote proper food safety practices?

Q16. List THREE reasons to describe why you are expected to perform food safety

Section III: Demographics

What is your gender?

- Male
- Female

QD2 What is your age?

QInt1

How strong is your intention to practice food safety at work?

- I have a strong intention to practice food safety behaviors at work
- I have intentions to practice food safety behavior at work
- Neutral
- I have less intention to practice food safety behavior at work

- I have no intention to practice food safety behavior at all

QD3 What kind of restaurant/foodservice type are you currently working with?

- Fast food restaurant/ quick-service restaurant
- Fast casual restaurant/ including buffet, ice cream shop, deli
- Dining hall/ including school/college food-service and government
- Casual dining restaurant/ including family Style
- Fine dining restaurant/ full service restaurant
- Other _____

QV4 Are you currently food safety certified?

- Yes, I am ServSafe certified.
- Yes, I am Learn2Serve certified.
- Yes, I have other food safety certification. _____
- No, I am not currently certified.

QD5 What is your highest education level?

- Some high school, no diploma
- High school graduate, diploma or the equivalent (for example: GED)
- Some college, or college credits
- Associate degree (for example: 2-year college)
- Bachelor's degree (or 4 year college)
- Graduate degree/ Master or Doctorate

QD6 What is your employment status?

- Employed full time (for e.g. 30 hr or above)
- Employed part time (for e.g. 29 hr or less)

Unemployed

Armed Forces

Other _____

QD7 Approximately, how many years have you been working in the restaurant/foodservice industry?
