DON'T TOUCH THAT: MANUFACTURING MANAGEMENT AND EMPLOYEE RISK PERCEPTIONS DIRECTING SAFETY STRATEGIES

A Thesis
by
CATHERINE ELIZABETH PARKS

Submitted to the School of Graduate Studies
at Appalachian State University
in partial fulfillment of the requirements for the degree of
MASTER OF ARTS

August 2022
Department of Psychology

DON'T TOUCH THAT: MANUFACTURING MANAGEMENT AND EMPLOYEE RISK PERCEPTIONS DIRECTING SAFETY STRATEGIES

A Thesis
by
CATHERINE ELIZABETH PARKS
August 2022

APPROVED BY:

_____
Timothy Ludwig, Ph.D.
Chairperson, Thesis Committee

_____
Shawn Bergman, Ph.D.
Member, Thesis Committee

_____
Yalçın Açıkgöz, Ph.D.
Member, Thesis Committee

_____
Rosemary Webb, Ph.D.
Chairperson, Department of Psychology

_____
Marie Hoepfl, Ed.D.
Interim Dean, Cratis D. Williams School of Graduate Studies

Abstract

DON'T TOUCH THAT: MANUFACTURING MANAGEMENT AND EMPLOYEE RISK PERCEPTIONS DIRECTING SAFETY STRATEGIES

Catherine Parks
B.A., University of North Carolina Wilmington
B.F.A, University of North Carolina Wilmington
M.A., Appalachian State University

Chairperson: Timothy Ludwig, Ph.D.

Risk perception describes the extent managers and employees perceive workplace safety hazards and risk. Managers' risk perception may influence whether they will take action to mitigate these hazards. Employee risk perception may influence how they behave around these hazards and whether they report hazards and/or incidents. This study further hypothesizes that the risk perceptions of managers moderate the relationship between employee risk perceptions and reporting behaviors. To assess risk perception, a new Management Perceived Job Risk Scale (MPJR) was developed and partially validated. Hypotheses were tested by administering risk perceptions assessments, an annual audit of manager actions, and employee safety reporting data from a textile manufacturing organization. Manager risk perceptions were found to be related to their safety actions especially in what they communicate to employees. Employee risk perceptions were also significantly related to their reporting behaviors. Manager risk perceptions did not moderate employee risk perceptions' relationship with reporting

behaviors. Limitations of the findings are discussed, along with their implications for future research on manufacturing employee and manager risk perceptions.

Acknowledgments

I would like to thank the members of my thesis committee: Dr. Yalçın Açıkgöz, Dr. Shawn Bergman, and Dr. Timothy Ludwig. Your patience, guidance, and encouragement have profoundly affected my skills as both a researcher and as a professional. Your suggestions and questions are undoubtedly responsible for much of the thinking which brought quality to this research endeavor.

Dedication

To my wife, the most incredible person I have ever met, and without whom I would be unable to perform as a functioning human being.

Table of Contents

Management Risk Perception Preceding Safety Strategy Implementation In a Manufacturing Environment

Introduction

The cognitive and contextual tools managers use to perceive safety hazards determine whether they should mitigate these risks. Similarly, the risks perceived by employees dictate how they navigate around hazards, and whether they should report them to management. Given this interdependency of employees on management to mitigate hazards, and of management on employees to report hazards, it is likely that these interpretations of risk are related to one another. The assessment of the likelihood of negative events occurring, and the degree to which one is concerned with consequences, is known as risk perception (Sjöberg et al., 2004). Risk perception is highly predictive of risky behavior, and misjudgments in risk perception may lead to risky behavior and otherwise inappropriate responses to risk (Rundmo, 1996). Risk perception is a continuous and adaptive process, as hazards are inherent in everyday life (Sjöberg et al., 2004).

However, individuals of specific vocations—such as manufacturing—are exposed to unique hazards which may be life-threatening. Some occupational hazards cannot realistically be mitigated beyond preventative means, placing the burden of managing safe behavior entirely on the employee. Moreover, it is the responsibility of management to establish those preventative means to preemptively protect employees, yet this may be dependent on manager risk perceptions to initiate implementation of safety-related actions or policies. As such, a greater understanding of the factors that may influence

manufacturing managers' perceptions of risk and subsequent decisions they make regarding that risk must be developed in the interest of safety.

"Risk" primarily refers to the possibility that an adverse event may occur leading to negative outcomes. Most concepts of risk share a common component: a discrimination between reality and chance (Sjöberg et al., 2004). There is a difference between the harm a hazard will bring, and what an individual *thinks* may happen if they interact with that hazard. "Objective" risk is the actual risk that exists regardless of whether we recognize it, and irrespective of whether it concerns us. Subjective judgments determine if this risk is perceived and mitigated. It is a common hypothesis that the disconnect between objective and subjective risk is what constitutes a misjudgment of risk, and thus puts employees in danger (Rundmo, 1996; Rundmo & Hale, 2003; Sjöberg et al., 2004).

After perceiving subjective risk, risk assessment catalogues the likelihood of a negative occurrence, the frequency of that occurrence, and the severity of consequences should the event occur (Rundmo, 1996). Subjective assessments may be influenced by a multitude of factors (Rundmo, 1996; Sjöberg et al., 2004), and several individuals may make different judgments about the same hazard because of those factors. The primary components owing to unique assessments of risk include cognitive factors (Eklöf & Törner, 2002; Ivensky, 2016; Rundmo, 1995; Rundmo, 2001; Slovic, 1999; Slovic et al., 2005; Stein et al., 2013), and contextual factors (Rundmo, 1996; Slovic, 1999; Xie et al., 2020). These cognitive and contextual tools help an individual execute a behavior, either avoiding, mitigating, or reporting on the hazard identified in the risk perception.

Cognitive Components of Risk Perception

Risk perception involves internal components unique to individuals, such as affect (Rundmo, 1995; Slovic et al., 2005), and psychological distance (Huang et al., 2019; Knuth et al., 2014). Affect typically refers to the automatic positive (like) or negative (dislike) feelings one has about a stimulus (Slovic, 1999; Slovic et al., 2005). For example, one may like or have positive feelings toward commercial travel and one may dislike or have negative feelings toward pesticides. Previous research has found that affect plays a key role in both perceived risks and benefits of a behavior. According to Slovic et al. (2005), if an individual has positive feelings toward a stimulus, they will be more likely to assess the risks as being low and the benefits as being high—if an individual feels negatively toward a stimulus, they will likely assess the risks as being high and the benefits as being low. This means that a significant portion of an individual's judgment about a stimulus depends on how they feel about the subject. This conclusion is aligned with previous research purporting that how an employee feels about their working conditions affects their risk perceptions (Rundmo, 1995, 1996, 2001).

Research by Rundmo (1995, 1996) demonstrated that employees who did not *feel* safe were more likely to have higher risk perceptions, more likely to have experienced injuries, and were more likely to be unsatisfied with their working conditions. The same theory of affect's role in risk perception is applicable to managers; a manager may perceive risks of a process as being lower if they *like* the process or associated factors, and in this case will likely perceive the benefits of the process as being higher. Inversely, a manager may perceive risks of a process as being higher if they *dislike* the process or associated factors, and would likely perceive the benefits as being lower. Thus, manager

feelings are an important consideration when assessing risk perceptions, given their propensity to affect the risk perceptions of employees. Additionally, employee feelings are important to consider, as their feelings toward the decisions managers make may influence how employees respond to those decisions and the risks they address. However, affect does not operate independently of other cognitive processes when it comes to perceiving risk.

Psychological distance is another key cognitive process in the formation and measurement of risk perception (Huang et al., 2019; Knuth et al., 2014). According to Huang et al. (2019), psychological distance is a cognitive division between oneself and other objects, people, or events in the environment. This division allows individuals to focus on specific aspects of risk, a hazard or an incident, and mentally remove themselves from the situation or attribute causes elsewhere. In doing so, psychological distance allows employees or managers to absolve themselves of thoughts of risk (Hansen et al., 2013; Huang et al., 2019).

There are several types of psychological distance one can use to separate themselves from things in their environment, all of which have been strongly correlated with one another. The two forms of psychological distance most relevant to the current measure of employee and manager risk perceptions are: emotional distance, and hypothetical distance (Liberman & Trope, 2008; Trope & Liberman, 2003). Emotional distance refers to the psychological distance between an individual and the people around them. People tend to believe that risky events will not affect them to the degree they will affect others, so when emotional distance is high (i.e., an individual is not socially close to someone who is hurt), an individual is less concerned with risk of the same injury.

Hypothetical distance refers to how likely an individual thinks a risky event is to occur—that is, when an individual imagines whether an incident is likely or unlikely to happen. When an incident is hypothetically near, it is perceived as highly probable and therefore the individual is likely more concerned with the risk. The inverse is also true; when an incident is hypothetically far, it is perceived as improbable and therefore the individual is likely less concerned with the risk.

Thus, to measure the core representations of risk individuals perceive in a hazard, one must consider the cognitive components of risk perception. That is, one should implement response cues which attend to manager and employee affect, and minimize the psychological distance the respondent is able to put between themselves and the perceived risk (Hansen et al., 2013; Huang et al., 2019; Liberman & Trope, 2008; Trope & Liberman, 2003). In doing so, the perceived risks associated with a hazard can be measured as they pertain to the individual, the way the individual feels about the hazard, and how concerned they are about the hazard in regards to the people around them.

Contextual Components of Risk Perception

In addition to cognitive processes, situational factors may influence risk assessment and risk-related behaviors. In fact, some research suggests that these contextual factors are more important than individuals' previous experience with safety incidents (Rundmo, 1996). An accident framework proposed by Xie et al. (2020) suggests that safety incidents include interactions between five major variables: equipment, internal environment, external environment, human, and management.

Equipment risk refers to the exposure of employees to hazards as a result of insufficient equipment, poorly designed equipment, equipment failures, or employees'

inability to operate equipment. The Internal Environment risk refers to the physical working conditions, as well as the psychosocial environment that an employee works in (i.e., organizational and safety culture; Xie et al., 2020). The External Environment risk refers to the physical and psychosocial environments outside the of the facility where an employee works (e.g., a facility may be located in an area more prone to natural disasters than others). The Human risk refers to an individual employee's behaviors in the work setting, as well as the behaviors of other people in that work setting (regardless of whether or not they work there; Xie et al., 2020). Finally, the Management risk denotes the risks employees may be exposed to as a result of organizational or managerial decisions, negligence, or otherwise poor incident management. This accident framework was conceptualized to address a gap in the literature regarding measurement of perceived job risk. Xie et al. (2020) adapted these situational variables into a scale of perceived job risk in the hotel industry (Hotel Employee Perceived Job Risk survey; HEPJR).

Behavioral Components of Risk Perception

Risk perceptions have been shown to be a critical precursor and influencer of behavior (Huang et al., 2019). A common hypothesis in risk perception research suggests that if perceptions influence behavior, we may be able to alter behavior through interventions aimed at changing peoples' perceptions of risk (Huang, et al., 2019; Kouabenan, 2002; Sjöberg et al., 2004).

Risk behavior is the degree to which an employee tends to engage in behaviors that put them at-risk by performing work tasks with behaviors that may not adhere to safety policies, trainings, job task procedures or may otherwise put them at-risk of injury (Rundmo, 1996). The relationship between perceived risk and behavioral risk has been

described as both reflective where risk perception is positively correlated with risk-taking behavior, and protective where risk perception is negatively correlated with risk-taking behavior, and (Mills et al., 2008).

Reflective. People tend to conceptualize risk with general qualitative representations, like "avoid risk," while quantitative representations involve considering balancing specific operational risks with benefits (Mills et al., 2008). Those who tend to think of risk quantitatively tend to engage in more risk-taking behaviors (Mills et al., 2008). Employees may have high risk perceptions regarding a specific hazard (e.g., being aware of the dangers of transporting heavy materials by hand), but choose to engage in risky behavior in or around that hazard because they have determined the benefit is worth the cost (e.g., moving materials by hand rather than waiting for a dolly because it is faster). As for managers engaging in reflective risk perception, they may have been aware of antiquated equipment in use by employees but refused to acquire up-to-date tools.

Protective. Risk perceptions may contribute to reporting safety events (i.e., minor injuries and near misses), which is essential for future error detection and resolution. Incidents are typically reported by workers in their daily interactions with hazards and risks. Analysis of safety reports can predict future safety events, as these minor events are typically a signal that more safety incidents might happen (Rundmo & Hale, 2003). Managers commonly use this collected data to predict future safety injuries through trends in these data leading to higher risk perception (Eklöf & Törner, 2002; Kessels-Habraken, 2010) leading to risk behaviors through the development and implementation of preventative measures (Kessels-Habraken, 2010; Reznek & Barton, 2014). Kessels-Habraken (2010) found that the key to increasing incident reporting is to conduct a

prospective risk analysis, as it can enhance employees' understanding of potential risks—effectively inducing a change in risk perception leading them to find risk when it was overlooked before. In fact, this study found that prospective risk analysis increased the frequency of reporting incidents, resulting in a broader array of incident types to be reported and yielded a larger percentage of reports submitted by higher-level management (Kessels-Habraken, 2010). It is no surprise, then, that risk perception has a relationship not only with risk-related behavior, but also with incident reporting behaviors.

However, not all behaviors are related to dichotomous risk perceptions such as "protectively avoiding risk" or "reflectively engaging risk"; some risk perception behaviors are geared toward responding to injuries or incidents before they occur (e.g., *I intend to develop and maintain a plan for how I will respond to slip, trip, or fall incidents in the future*). An example, then, of protective risk perceptions on the part of management may be that they have been made aware of defects in equipment subordinates were supposed to use, and prohibited use of that equipment as a result.

The Interaction of Management and Employee Risk Perceptions

According to Rundmo and Hale (2003), attitudes and decisions of middle management may directly affect the attitudes and behaviors of employees. Further, management dedication to safety was one of the strongest predictors of near misses (i.e., incident where no injuries or damage occurred, but slightly different circumstances could have ended in damage or harm; Phimister et al., 2003) and safety incidents (i.e., injuries; Rundmo & Hale, 2003). Rundmo (2001) also found that management production priorities were the strongest predictor of whether employees thought it was acceptable to

violate safety rules. The more importance management placed on production targets, the more acceptable employees perceived it to be to take safety risks and disobey rules. If employees view risk in their environment while their manager does not, it is possible the manager's perceptions or emphasis elsewhere can influence employee perceptions (Rundmo & Hale, 2003). These misperceptions can lead to disagreements, inappropriate distribution of resources, and may even lead to catastrophic safety incidents (Ivensky, 2016).

Managers act as strong exemplars for employees, as they have the potential to exert great influence over their subordinates in many different forms. Lingard et al. (2012) found that if managers explicitly communicate strong safety values, and support those values with consistent behavior, employees will likely develop the same values and eventually mirror those safety behaviors. In this way, management risk perceptions act as contextual guides for employees during both the development of risk perceptions and the incidence of response behaviors. Additionally, employee perceptions of management's commitment to safety were strongly positively correlated with how employees perceived management safety actions (Lingard et al., 2012). Perhaps most notably, the higher employees perceived managers' safety expectations to be, the less likely they were to become injured.

Manager risk perceptions may affect important safety-related manager behaviors. Managers are in a position to change the objective risks in a work environment as well as impact employee safety perceptions and behaviors. Further, the perceptions and thereby, actions of management affect employees and how they perceive risk (Ivensky, 2016; Lingard et al., 2012; Rundmo, 2001; Rundmo & Hale, 2003; Xie et al., 2020), However,

it is unclear whether the opposite is also true—how employee perceptions and actions affect management perceptions and behaviors, whether employee perceptions function as a contextual factor of risk perception for managers.

Previous research on risk and safety have examined employee and lay-person judgments (Ivensky, 2016; Rundmo & Hale, 2003), but few have considered the role of manager perceptions and attitudes in safety. Fewer still have considered the relationship between employee and manager risk perceptions—particularly in a manufacturing context—and the outcomes of each set of perceptions on subsequent behaviors. It is unclear the degree to which a manager's perceived risk motivates them to make safety changes in their environment. It is also unclear whether those management actions are a visible enough for employees to experience similar risk perceptions (Lingard et al., 2012) and increase their incident reporting practices.

Manufacturing Risk Perception and Behavior Model

This study serves to develop and validate a model of risk perception in manufacturing settings, examining how risk perceptions direct behaviors, and how those behaviors further influence risk perceptions in others. Employee safety perceptions and behaviors are thought to be products of observed management safety actions (Lingard et al., 2012). Considering the research highlighting the relationship between risk perception and intent to engage in risk behavior, we can conceptualize safety behavior in a manufacturing setting as a function of the interaction between manager and employee risk perception.

Given differences in hierarchical positions, managers and employees express their risk perceptions through different behaviors directed at impacting the safety of others.

Managers have the opportunity to act on their perceptions of risk with many heuristic strategies like policy changes, new safety practices, hazard mitigation, additional training and the like. Employees generally act on their risk perception while engaging in their tasks using behaviors that avoid or mitigate hazards. Beyond task-specific safety behaviors, manufacturing employees can act on their perceptions of risk by reporting first aids, near misses, suggestions, concerns, and injuries as a result of their risk perceptions.

The Manufacturing Risk Perception and Behavior Model depicted in Figure 1 is proposed. This model proposes a path from risk perception to behavior at different organizational levels (i.e., managers versus employees), and the hypotheses to test the model are as follows:

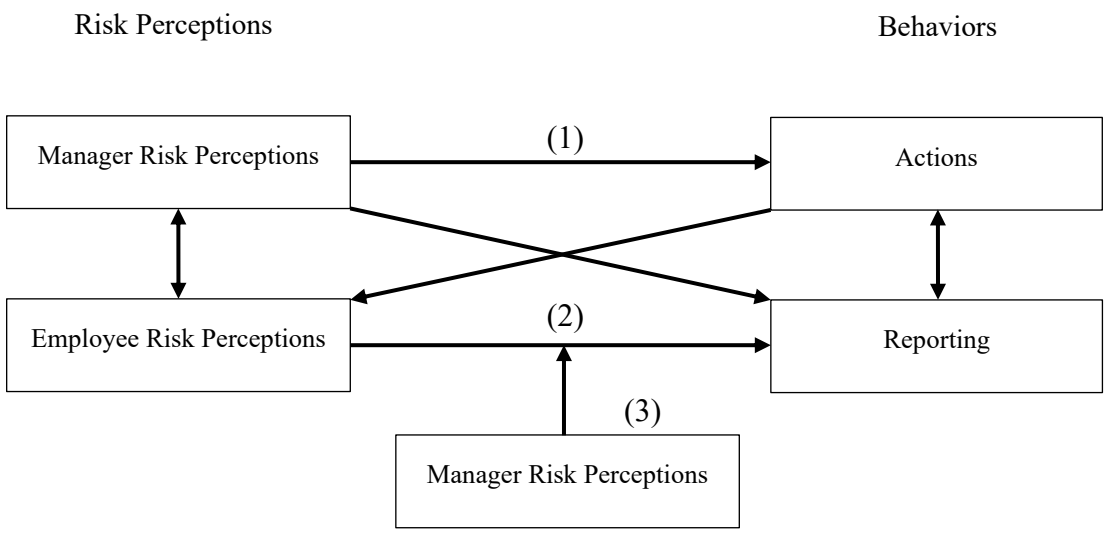
(1) There will be a relationship between manager risk perceptions and actions taken to mitigate risk

(2) There will be a relationship between employee risk perceptions and employee incident reporting behaviors (Kessels-Habraken et al., 2010)

(3) Manager risk perceptions moderate the relationship between employee risk perceptions and employee reporting behaviors.

Figure 1

Manufacturing Risk Perception and Behavior Model



Method

Participants

Study participants were recruited from a global threads and fabrics manufacturer (hereafter referred to as the organization). Participants were recruited for the study through purposive sampling, distributed through the organization, and did not receive compensation. Inclusionary criteria include employees who were, at the time of collection: department managers, plant managers, safety coordinators, department supervisors, shift supervisors, and hourly production employees at seven North America plants.

Seven of the organization's plants participated in the study. Participating plants were those whose employees reported the most near-misses and minor injuries since the beginning of 2021. See Table 1 for a brief overview of manager and safety coordinator count, and the main output(s) of each facility.

Table 1

Facility Characteristics

Facility Code	Managers	Safety Coordinators	Facility Output(s)
A	7	1	Spun Threads (cotton, cotton core, aramids)
B	3	1	Bond Thread (polyester and nylon)
C	24	0*	All dyed threads (polyester, rayon, nylon, cotton, cotton core, polyester core, aramids)
D	7	0*	Spun threads (polyester, polyester core, hygiene string)
E	7	1	Distribution for all threads (polyester, rayon, nylon, cotton, cotton core, polyester core, aramids)
F	15	1	Twisted filaments (polyester, nylon, aramids)
G	7	1	Spun threads (aramids)

Note: An asterisk denotes plants that do not have their own designated safety coordinator, but share a safety coordinator with another facility.

Plant A processed raw cotton, cleaned, and prepared it for spinning. Plant B prepared filaments for dyeing. Plant C dyed and finished products as well as packaging and delivering to clients. Plant D processed and prepared raw polyester. Plant E acted as a distribution center for all threads. Plant F twisted processed materials to strengthen and prepare them for further processing (e.g., dyeing). Finally, Plant G processed and prepared aramid fibers (i.e., man-made high-performance fibers) for further processing.

These facilities each produce different products at varying stages of completeness within the organization's supply chain, and contain unique departments. However, there were also identical departments across facilities. Risk perception surveys were distributed to the entirety of each facility. However, not every department from each facility returned completed risk perception measures. Table 2 shows a complete list of each facility's departments and the number of employees in each; with shaded departments representing

the ones participating in this study. Some employees work in multiple departments, but were only included in the first department they appeared in on the demographic sheet acquired from the organization. Thus, departments which show 0 employees that were included in the study are the result of responses from roving employees.

Table 2

Facility Departments and Employee Count

Department	A	B	C	D	E	F	G	Total
Air Texturing	0	0	0	0	0	9	0	9
Bobbin	0	0	2	0	0	0	0	2
Bonding	0	41	1	0	0	11	0	53
Carding	18	0	0	8	0	0	10	36
Doubling	12	0	0	10	0	15	6	43
Dyehouse	0	0	75	0	0	0	0	75
Fancy Cord	0	0	0	32	0	0	0	32
Glazing	0	0	3	0	0	0	0	3
Maintenance	0	0	24	0	5	0	0	29
Management	7	5	28	9	5	13	8	75
Packing	0	0	43	0	0	0	0	43
Receiving	0	0	5	0	0	0	0	5
Shipping	3	0	17	3	38	13	2	76
Shop	9	8	0	6	0	23	13	59
Spinning	33	0	0	34	0	0	38	105
Tea Bag	0	0	8	0	0	0	0	8
Twine	0	0	0	6	0	0	0	6
Twisting	9	0	0	13	0	96	5	123
Quality Control Lab	0	2	8	0	0	0	0	10
Winding	11	0	174	15	0	51	4	255
Total	102	56	388	136	48	231	86	1047

Just as different facilities produce different products and house different departments, each facility is unique in its employee composition. Table 3 shows available demographic information (i.e., gender and tenure) for participating facilities, as released by the organization.

Table 3

Facility Demographics

Facility	Females	Average Female Age	Males	Average Male Age	Average Age	Age Min.	Age Max.	Average Tenure (in years)	Tenure Min.	Tenure Max.
A	47	49	55	46	48	20	73	7	0.00	42.7
B	6	44	50	39	40	20	71	6	0.00	39.4
C	210	47	178	44	45	17	76	8	0.00	47.4
D	73	48	63	47	47	18	77	7	0.00	46.4
E	22	47	26	48	47	19	77	11	0.10	57.3
F	124	45	107	49	47	19	72	7	0.00	49.3
G	40	45	46	48	47	19	82	8	0.00	48.8

Appalachian State University's Institutional Review Board approved this research (IRB # 22-0099; see Appendix A). The researchers also secured an additional memorandum of understanding from the host organization, which dictates specific allowances for data, and outlines assurances for both participating employees and those who declined to respond (see Appendix B). Finally, employees were given access to a consent document to determine whether or not they wanted to participate in the study (see Appendix C).

Risk Perception Assessments

Manufacturing Risk Perception. The Hotel Employees' Perceived Job Risk scale (HEPJR; Xie et al., 2020) was adapted to measure manufacturing-specific occupational risk perceptions. The Cronbach's alpha reliability of the HEPJR scale was reported by Xie et al. (2020) as ranging from 0.78 to 0.86 across scale dimensions. Standard factor loadings suggested the HEPJR consists of the following factors: Perceived Personnel Risk (0.72), Perceived Equipment Risk (0.83), Perceived External Environmental risk (0.74), Perceived Internal Environmental Risk (0.74), and Perceived Management Risk (0.74). Subject matter experts conducted q-sort arrangement of items

into factors and found consensus in the content validity of 28 items measuring the concept of HEPJR, and after initial analysis was reduced to 26 items. Average variance extracted ranged from 0.52 to 0.69, meaning that the items were able to explain more of the concepts than they were unable to; demonstrating good convergent validity. Finally, the correlation coefficients between HEPJR (Xie et al., 2020) constructs were all lower than 0.70, which confirms good discriminant validity. The original HEPJR can be found in Appendix F.

The HEPJR was adapted for a manufacturing context in this study to create the *Manufacturing Perceived Job Risk* scale (MPJR). In the revision into the MPJR from the HEPJR, the word "hotel" was replaced with the word "plant," the survey was shifted from first to third person, and the subject of each item was converted into the language a manufacturing organization commonly uses. For example: the HEPJR item, "*customers' improper behavior may hurt me*," was altered in the MPJR to "*associates can get hurt if their coworkers don't follow safety protocols*". To indicate their level of perceived risk on the majority of MPJR items, participants used a 7-point rating scale (1 = "*Completely Disagree*" to 7 = "*Completely Agree*"). The final version of the MPJR included 28 items (see Appendix G).

Topical Risk Perception. To assess risk perception around specific types of hazards in manufacturing environments, we adapted the Broadly Applicable Measure of Risk Perception scale (BAMRP; Wilson et al. 2019; Appendix H). The Cronbach's alpha reliability of the BAMRP ranged from 0.77 to 0.90 across scale dimensions. The standardized factor loadings used to assess the affect risk perception item ranged from 0.81 (eating potentially contaminated food) to 0.86 (extreme weather events). The

standardized factor loadings used to assess the consequences risk perception item ranged from 0.71 to 0.83 (Wilson et al., 2019).

Corporate Safety Topics. The BAMRP was adapted for a manufacturing context to measure participants' hazard-specific risk perceptions around corporate safety topic campaigns in the host organization. The organization's safety leadership delivered quarterly Safety Focus topics, based on recent incidents, at the beginning of each fiscal quarter through email communication to all plant managers. Managers were provided literature, and were required to complete a computer-based multiple-choice test. After which, managers used a standardized a checklist to assess each focus topic; any gaps were to be mitigated through subsequent actions.

A slips, trips, and falls (STF) safety focus program email communication contained: the definition of fall hazards, walking-working surface requirements, fall hazards, and ways to prevent fall hazards. The STF checklist focused on workplace housekeeping roles and tasks. The organization's full STF program guide is available in Appendix D. A Manual Material Handling (MMH) safety focus program email communication contained: a definition of MMH as the process of repeatedly moving objects through "carrying, holding, lifting, pulling, pushing, and stooping" (National Institute of Occupational Safety and Health, 2021), requirements for policies, management responsibilities, details on safety assessments (i.e., inspections and audits), training requirements, and incident investigations. The MMH checklist included assessments of teams, policies and procedures, and job screening for MMH risks. The organization's full MMH program guide is available in Appendix E.

Topical Risk Perception Survey Development. The BAMRP (Wilson et al., 2019) was adapted into a Topical Risk Perception Survey (TRP). Two subscales assessed risk perception around "slips, trips, and falls," and "manual material handling", to create the Topical Risk Perception scales: TRP-STF and TRP-MMH. To do this, the question "*how concerned are you (if at all) about X*," was modified where "X" was replaced with STF or MMH. The question "*if I did experience X, it is likely that it would negatively affect me*," where "X" was replaced with STF or MMH. Lastly, the questions "*I intend to search for information about preparing for X and safety protocols in the future*," and "*I intend to develop and maintain a plan for how I will respond to X in the future*," were modified to include reference to STF or MMH.

To indicate their level of perceived risk on MPJR survey items, participants used a 7-point rating scale (1 = "*Completely Disagree*" to 7 = "*Completely Agree*"). To indicate their level of concern on corporate safety topic items, participants used a 7-point rating scale (1 = "*Not at all concerned*" to 7 = "*Extremely Concerned*"). The items adapted from the BAMRP into the TRP totaled in sixteen items (see Appendix I).

Two additional Topical Risk Perception (TRP) subscales were developed around topics that were not in the quarterly safety topics. Risk perceptions surrounding pinch-points/caught-in/entrapment (TRP-PP), and powered industrial trucks (TRP-PIT) were developed using the same method discussed above. These additional Topical Risk Perception surveys served as comparison measures to determine if assessments of TRP-STF and TRP-MMH differed from TRP-PP and TRP-PIT because of the quarterly safety topics disseminated by the organization.

To summarize, modified versions of both the HEPJR and BAMRP were used in this study to produce the: MPJR, TRP, TRP-STF, TRP-MMH, TRP-PP, and TRP-PIT. These scales were then administered to plant, departmental, safety, and shift managers and hourly employees.

Manager Actions

Health and safety subject matter experts (SMEs) administered an annual Focus Change Audit (FCA) at the end of the calendar year after the two quarterly safety focus initiatives (see Appendix J). The FCA was administered to plant managers, department managers and/or safety coordinators through the organization's SharePoint system. The FCA asked management to describe actions they engaged to mitigate hazards at their plant. There were also questions associated with the quarterly safety focus topics (STF & MMH).

Management respondents indicated whether or not they had verbally or visually communicated the importance of being aware of hazards associated with the quarterly safety focus topics (STF & MMH) to their employees, and how they communicated this (e.g., "*Posted signage around the facility*"). Respondents selected from a list of dropdown options containing typical hazard awareness communication methods used by the company, as suggested by SME input. Should a manager indicate they had communicated focus topic hazard awareness in a manner *other* than those proposed by SMEs, an open text response section allowed them to list their communication method(s).

Next, respondents selected from a list of potential mitigation actions generated based on SME guidance (e.g., "*Changed a practice to prevent future STF hazards*"), described the change, and identified what quarter of the year they enacted this change.

Should a participant indicate that they implemented a change *other* than those proposed by SMEs, they would list the actions they took in an open text response section.

The completed FCA was then made available in SharePoint for researchers to access. Management Actions were then categorized into the following categories:

- Communication
    - One time safety talk
    - Incorporating in daily or weekly meetings
    - Posting signage around the facility
    - Rewards for reporting
    - Other
- Policy Statement
- Change Work Practice
- Initiate Training
- Initiate Information Sharing Program
- Other

These actions were then summed by risk perception category and matched with departments. For example, if a manager reported using two methods of communicating STF hazards to employees, and also enacted a policy and trained employees to prevent STF hazards, their department would be marked as receiving four total STF prevention actions. Inversely, if a manager reported that they did not communicate MMH hazards to employees, and did not take any preventative actions, their department would be marked as receiving zero total MMH mitigation actions.

Employee Reporting

Reporting of minor injury and near misses by employees was recorded and collected via the organization's internal cloud-based collaboration network and incident reporting software (SharePoint). Employees notify their supervisor(s) of any level of injury, ranging from incidents which did not require first aid, incidents requiring first aid, and injuries that resulted in lost time and days away from work. This reporting is then documented and entered into the SharePoint system. These secure systems were also used for distribution and response collection of the RPS and FCA. Please see Table 4 for the distribution of employee reporting based on facility and department, containing data from January 2021 to February of 2022.

Table 4

Reporting Data by Department and Facility

Department	A	C	D	E	F	G	Total
Carding	2		1			3	6
Doubling	3		2		6		11
Dyehouse		15					15
Fancy Cord			5				5
Maintenance				2	1		3
Management				1			1
Packing		11			5		16
Receiving		2					2
Shipping	2			11	1		14
Spinning	8		4			17	29
Twine			3				3
Twisting	1		2		38		41
Quality Control Lab		2					2
Winding	3	32	1		21	2	59
Total	19	62	18	14	72	22	207

Procedure

The study took place over the course of a half calendar year. Participants took part in the STF focus program in July of the calendar year. Participants then took part in the MMH focus program at the beginning of the fourth fiscal quarter in October of the calendar year. At the end of the calendar year managers were then instructed to complete a computer-based multiple-choice test, complete an FCA, and report all scores and findings to EH&S leadership.

In February of the next calendar year, plant managers, department managers, safety coordinators, and front-line employees received an email requesting the completion of the MPJR and TRP risk perception surveys (i.e., STF, MMH, PP, PIT) administered through the organization's cloud-based collaborative platform (SharePoint). Demographic variables on these scales included: facility, employment level (i.e., employee or manager), and whether the participant was exclusively Spanish-speaking. No names were requested or collected as part of this study.

Facilities received Spanish translations of the MPJR and TRP to accommodate for the front-line employees who exclusively spoke Spanish. Many participating facilities did not have adequate resources to virtually distribute surveys to employees. As such, the majority of risk perception surveys received from hourly employees were completed on paper without names. Hard copies were stored behind lock-and-key by facility management, then later manually entered by researchers. The digital data was stored on the organization's SharePoint server, and was only accessed and downloaded by the researchers through a secure portal built for the researchers and protected by two-layer

encryption and authentication. These data accession and collection processes also occurred under the protection of a virtual private network (VPN) software.

Results

The study totaled in 280 responses across five levels of employment within the seven plants. This data consisted of both digital (*N* = 54*)* and paper (*N* = 226) responses. Forty-eight risk perception surveys were collected from exclusively Spanish-speaking front-line workers (*N* = 48). Only a single risk perception survey was received from Facility B. As such, Facility B was excluded from all subsequent analyses, resulting in a final *N* = 279. Please see Table 5 to find the distribution of responses collected from different levels of employment by facility.

Table 5

Facility/Employment Level Responses

Position	A	C	D	E	F	G	Total
Plant Manager	0	2	3	2	2	1	10
Safety Coordinator	1	0	1	0	1	1	4
Department Manager	2	2	4	1	5	3	17
Supervisor	3	9	8	5	11	6	42
Operator/Production/Technician	26	40	28	15	65	32	206
Total	32	53	44	23	84	43	279

Of the usable sample, 54 response dyads between departmental hourly employee samples and their direct departmental supervisors were matched. If more than one immediate supervisor existed for a department their risk perception scores were aggregated together. Employee samples for each department were also aggregated. Plant managers, safety coordinators, department managers, and shift supervisors were included in the departmental level of risk perception aggregation for “manager risk perception”. Aggregates of manager risk perceptions and aggregates of employee risk perceptions

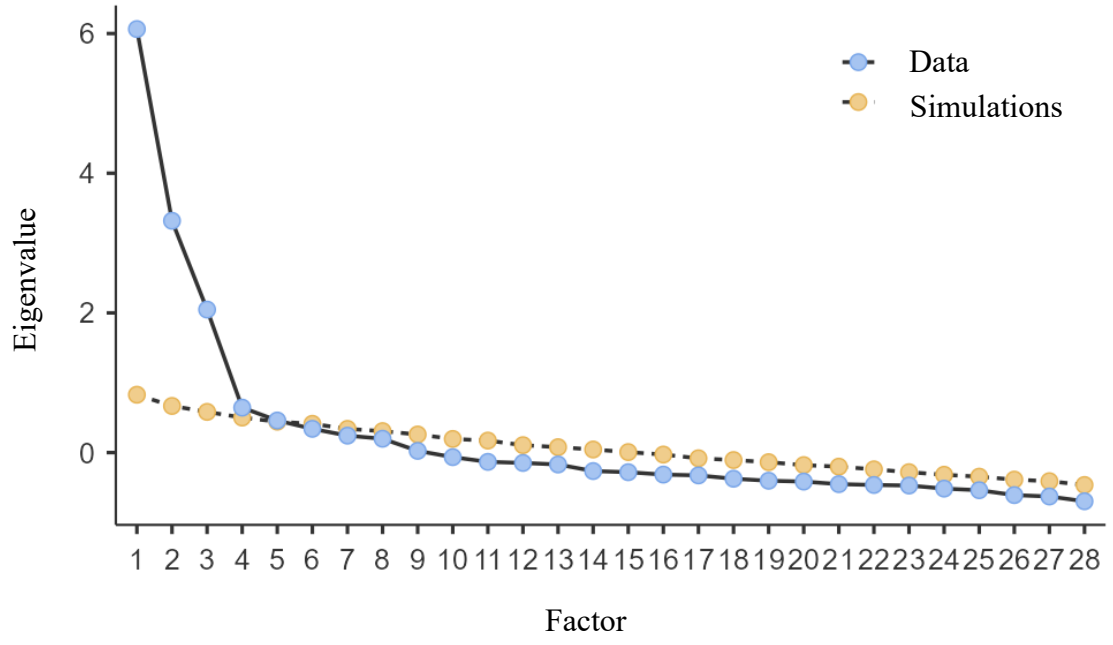
were created for each scale and each topic (i.e., “manager MPJR risk perception”, “employee STF risk perception”, etc.). Further, TRP risk perception was created as an aggregate of all four TRP sub-scales.

MPJR Scale Validation

An Exploratory Factor Analysis (EFA) resulted in a Cronbach’s alpha reliability of the MPJR ranging from 0.85 to 0.86 across scale dimensions, and a total scale reliability α = .83. Factor loadings below 0.3 were omitted; then, to determine the number of factors to retain in further analyses, a parallel analysis was conducted. The Scree plot generated by the parallel analysis indicated that five factors sufficiently exceeded randomness (see Figure 2).

Figure 2

MPJR Exploratory Factor Analysis Scree Plot (comparison to randomness)



Standard factor loadings suggest the MPJR consists of five factors; however, these factor loadings are not identical to those originally observed by Xie et al. (2020) in their HEPJR.

Factor loadings from our EFA can be interpreted as: Perceived Management Risk ($\alpha = .87$), Perceived Internal Environmental Risk ($\alpha = .88$), Equipment and Strain Risk ($\alpha = .77$), Perceived Personnel Risk ($\alpha = .81$), and Perceived External Environment Risk ($\alpha = .65$). See Table 6 for the factor loadings of the MPJR.

Table 6

MPJR Factor Loadings

	Factor					
Item	1	2	3	4	5	Uniqueness
Q28	0.979					0.19306
Q27	0.943					0.20985
Q26	0.862					0.28004
Q25	0.705					0.56186
Q19	0.534					0.69291
Q21	0.456					0.65556
Q22	0.456					0.64193
Q12	0.449					0.77775
Q18		0.834				0.29999
Q17		0.821				0.34244
Q20		0.762				0.47322
Q15		0.730				0.43867
Q14		0.693				0.42990
Q13		0.593				0.66200
Q7			0.779			0.50482
Q8			0.711			0.53999
Q6			0.704			0.48326
Q10			0.640			0.65765
Q11			0.632			0.48547
Q9			0.561			0.56623
Q4			0.378			0.76405
Q1			0.351			0.84587
Q3				1.104		0.00500
Q2				0.704		0.47162
Q5			0.347	0.443		0.45819
Q23					0.724	0.46101
Q16		0.365			0.576	0.36878
Q24					0.503	0.61375

Note. *'Maximum likelihood' extraction method was used in combination with a 'promax' rotation*

The correlation coefficients between constructs were all lower than 0.70, which confirms good discriminant validity. Please see Table 7 for inter-factor correlations.

Table 7

MPJR Inter-Factor Correlations

	1	2	3	4	5
1	—	0.496	0.0609	-0.296	0.177
2		—	-0.0127	-0.300	0.342
3			—	0.516	-0.266
4				—	-0.227
5					—

Average variance extracted from each of these factors ranged from 0.05 to 0.14, with cumulative variance extracted totaling at 0.504, meaning that the items were able to explain slightly more of the concepts than they were unable to (explained almost 51% of total variance); demonstrating a low degree of convergent validity. Please see Table 8 for variance extracted from each identified factor.

Table 8

MPJR Variance Extracted

Factor	SS Loadings	% of Variance	Cumulative %
1	3.87	13.81	13.8
2	3.67	13.12	26.9
3	3.16	11.29	38.2
4	1.93	6.89	45.1
5	1.49	5.31	50.4

Finally, Table 9 shows descriptive statistics of responses collected on each MPJR item, and Appendix K includes additional reliability statistics for each MPJR item.

Table 9

MPJR Response Distributions

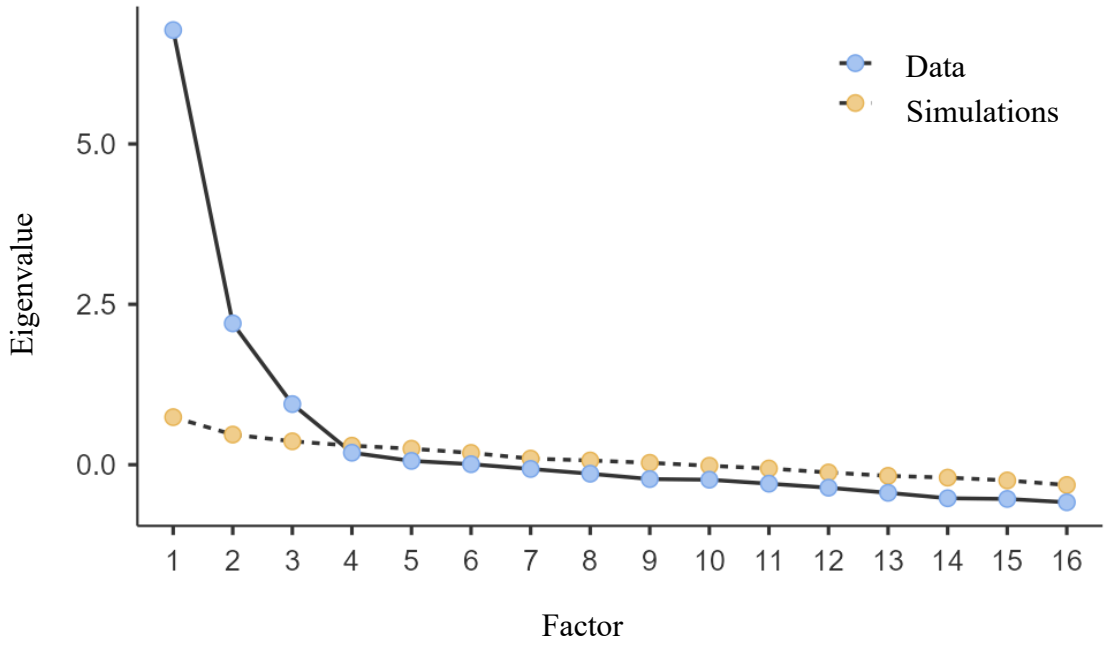
Item	N	Median	Mean	Standard Deviation	25th Percentile	75th Percentile	Histogram
Q1	278	6	5.53	1.59	5	7	
Q2	278	7	6.64	1.00	7	7	
Q3	278	7	6.51	1.09	6.25	7	
Q4	275	5	5.05	1.79	4	7	
Q5	263	7	6.54	0.89	6	7	
Q6	261	7	6.47	1.01	6	7	
Q7	262	6.5	6.00	1.33	5	7	
Q8	264	6	5.69	1.50	5	7	
Q9	263	7	6.43	0.97	6	7	
Q10	264	7	6.17	1.28	6	7	
Q11	264	7	6.58	0.99	7	7	
Q12	260	3	3.28	1.93	1	5	
Q13	278	2	2.32	1.52	1	3	
Q14	278	2	2.17	1.28	1	3	
Q15	275	2	2.80	1.62	2	4	
Q16	275	2	2.53	1.53	1	3	
Q17	277	2	2.80	1.76	1	4	
Q18	277	2	2.46	1.54	1	3	
Q19	275	4	3.94	1.70	2.5	5	
Q20	278	2	2.78	1.61	2	4	
Q21	273	4	3.66	1.76	2	5	
Q22	275	4	3.88	1.85	2	5	
Q23	276	2	2.30	1.61	1	3	
Q24	271	2	2.48	1.49	1	4	
Q25	275	3	3.20	2.08	1	5	
Q26	276	3	3.11	1.87	1	4	
Q27	276	2.5	3.00	1.89	1	4	
Q28	277	3	3.06	1.92	1	4	

An additional EFA resulted in a Cronbach's alpha reliability of the aggregate 16-item TRP (i.e., STF, MMH, PP, and PIT) ranging from .90 to .91 across scale dimensions, and a total scale reliability $\alpha = .91$. Factor loadings below 0.3 were omitted; then, to determine the number of factors to retain in further analyses, a parallel analysis

was conducted. The Scree plot generated by the parallel analysis indicated that three factors sufficiently exceeded randomness (see Figure 3).

Figure 3

TRP Exploratory Factor Analysis Scree Plot (comparison to randomness)



See Table 10 for the factor loadings of the TRP including all of its subscales. Standard factor loadings suggest the TRP consists of three factors: Information Seeking and Planning (α = .95), Perceived Incident Risk (α = .89), Perceived Incident Consequences (α = .85).

Table 10

TRP Factor Loadings

	Factor			
Item	1	2	3	Uniqueness
Q39	0.892			0.188
Q40	0.883			0.223
Q35	0.882			0.205
Q36	0.867			0.257
Q44	0.854			0.263
Q43	0.848			0.226
Q31	0.745			0.450
Q32	0.729			0.487
Q33		0.895		0.216
Q41		0.841		0.293
Q37		0.803		0.335
Q29		0.712		0.462
Q38			0.938	0.221
Q42			0.827	0.337
Q34			0.751	0.316
Q30			0.564	0.628

Note. *'Maximum likelihood' extraction method was used in combination with a 'promax' rotation*

The correlation coefficients between constructs were all lower than 0.50, which confirms excellent discriminant validity. Please see Table 11 for inter-factor correlations.

Table 11

TRP Inter-Factor Correlations

	1	**2**	**3**
1	—	0.346	0.354
2		—	0.468
3			—

Average variance extracted from each of these factors ranged from 0.15 to 0.36 and totaled at 0.68 cumulative variance extracted, meaning that the items were able to explain more of the concepts than they were unable to (explaining approximately 68% of total variance); demonstrating adequate convergent validity. Please see Table 12 for TRP variance extracted.

Table 12

TRP Variance Extracted

Factor	SS Loadings	% of Variance	Cumulative %
1	5.72	35.7	35.7
2	2.70	16.9	52.6
3	2.47	15.4	68.1

Finally, please see Table 13 for descriptive statistics of responses collected on each TRP item, and Appendix I for additional reliability statistics for each TRP item.

Table 13

TRP Response Distributions

Item	N	Median	Mean	Standard Deviation	25th Percentile	75th Percentile	Histogram
Q29	277	5	4.59	1.87	3	6	
Q30	278	5	4.56	1.71	4	6	
Q31	275	5	5.00	1.54	4	6	
Q32	277	5	5.19	1.44	4	6	
Q33	273	5	4.51	1.72	4	6	
Q34	273	5	4.60	1.63	4	6	
Q35	274	5	4.94	1.50	4	6	
Q36	272	5	5.18	1.40	4	6	
Q37	274	5	4.96	1.75	4	6	
Q38	275	5	4.80	1.80	4	6	
Q39	277	5	5.08	1.47	4	6	
Q40	273	5	5.26	1.41	4	6	
Q41	277	5	4.55	1.91	4	6	
Q42	275	5	4.95	1.79	4	6	
Q43	276	5	5.03	1.50	4	6	
Q44	262	5	5.10	1.51	4	6	

From the responses, MPJR Risk Perception, TRP Risk Perception (across all subscales), and Overall Risk Perception were calculated for the total sample, for managers, and for front-line employees. Means, standard deviations, and correlations for the total sample risk perceptions are reported in Table 14, while manager and employee risk perceptions are reported in Table 15.

Table 14

Means, Standard Deviations, and Correlations Among the Total Sample

	M	SD	1	2	3	4	5	6
1. Overall RP	4.44	0.63	—					
2. MPJR RP	4.19	0.71	0.80***	—				
3. STF RP	4.83	1.14	0.67***	0.2***	—			
4. MMH RP	4.81	1.19	0.64***	0.09	0.78***	—		
5. PP RP	5.02	1.16	0.65***	0.12*	0.72***	0.83***	—	
6. PIT RP	4.9	1.24	0.61***	0.09	0.67***	0.79***	0.82***	—
7. TRP RP	4.89	1.07	0.70***	0.14*	0.87***	0.94***	0.93***	0.90***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; *the sample sizes for each of these correlations ranged from 274 to 279.*

Table 15

Means, Standard Deviations, and Correlations Among Employee and Manager Risk Perceptions

	M	SD	1	2	3	4	5	6
1. Employee Overall RP	4.42	.64	—					
2. Employee MPJR RP	4.23	.72	.80***	—				
3. Employee TRP RP	4.77	1.07	.70***	.14*	—			
4. Manager Overall RP	5.11	.29	.09	-.03	.18*	—		
5. Manager MPJR RP	4.96	.34	-.08	-.17*	.08	.72***	—	
6. Manager TRP RP	5.42	.54	.16*	.11	.13	.46***	-0.047	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Relationship between Manager Risk Perception and Actions

Hypothesis 1 was supported. A significant correlation was found between manager overall risk perception and total number of mitigation actions reported in the

FCA (r = .67, p<.001). Additionally, manager TRP risk perceptions were positively correlated with total mitigation actions taken (r = .66, p< .001), total STF mitigation (r = .67, p< .001), and total MMH mitigation (r = .58, p< .001). Additionally, manager STF risk perception was positively correlated with the number of mitigation actions related specifically to STF (r = .54, p< .001). Finally, manager MMH risk perception was positively correlated with mitigation actions related specifically to MMH (r = .59, p< .001).

One hundred fifty-four binomial logistic regressions tested the relationships between manager risk perceptions (i.e., overall, MPJR, TRP, STF, MMH, PP, and PIT) and manager actions (i.e., putting in place a policy, changing a practice to prevent future hazards, initiating training, or using a new information sharing practice) reported in the FCA (Appendix L). The following relationships were significant.

Predicting STF Manager Actions. Manager overall risk perceptions significantly predicted whether managers reported "actively communicated" STF hazard awareness to employees $\chi^2(1) = 4.17$, $p < .05$. The model is 18.1% (Nagelkerke R^2) more predictive of communication than the null model, and correctly classified 100% of observed cases.

For every one-point increase in overall manager risk perceptions above the mean (on the 7-point Likert scale), the likelihood that a manager would communicate STF hazard awareness to employees increased by nearly seven times (OR = 6.77, 95% CI [0.89, 51.23]). Manager MPJR risk perceptions were also able to significantly predict whether managers reported actively communicating STF hazard awareness to employees $\chi^2(1) = 6.50$, $p = .01$. The model was 27.7% more predictive of communication than the null model and correctly classified 98% of observed cases. For every one-point increase

above the average MPJR risk perception, managers became twelve times more likely to communicate STF hazard awareness to employees than those with average or below average MPJR risk perceptions (OR = 12.05, 95% CI [1.25, 116.63]).

Further, manager Overall RP, MPJR, MMH, and PP risk perceptions were able to significantly predict *how* managers would communicate this importance (i.e., one-time STF safety talk, daily or weekly STF hazard discussion, posted STF signage, rewarding STF reporting, or other).

Risk perception toward other topics also seemed to impact STF actions. Manager MMH risk perceptions $\chi^2(1) = 5.28$, $p = .02$ significantly predicted whether a manager would communicate STF hazard awareness through a one-time safety demonstration. The model was 12.5% more predictive of communication than the null model, and correctly classified 37.5% of observed cases. For every one-point increase above the average in MMH risk perception, the likelihood that a manager would communicate STF hazard awareness through a one-time safety demonstration decreased by 46% (OR = 0.54, 95% CI [0.31, 0.94]). Manager PP risk perceptions significantly predicted whether a manager would give a one-time safety talk or demonstration on STF awareness $\chi^2(1) = 4.37$, $p < .05$. The model explained 10.4% more of communication than the null model, and correctly classified 42% of cases. For every one-point increase in manager PP risk perceptions over the mean, the likelihood that they would have given a one-time STF safety talk decreased by 43% (OR = 0.57, 95% CI [0.32, 0.99]).

Manager overall risk perception significantly predicted whether a manager would report using a communication method *other* than a one-time STF safety talk, daily or weekly STF hazard discussion, posted STF signage, or rewarding STF reporting $\chi^2(1) =$

6.00, p = .01. The model was 16.5% better at explaining communication than the null model, and correctly classified 9% of cases. For every one-point increase above the average in overall risk perception, managers became five times more likely to communicate STF hazard awareness to employees than those with average or below average overall risk perceptions (OR = 5.06, 95% CI [1.18, 21.67]).

Manager MPJR risk perception significantly predicted whether a manager would report communicating STF hazards in a way *other than* a one-time STF safety talk, daily or weekly STF hazard discussion, posted STF signage, or rewarding STF reporting $\chi^2(1) = 5.70$, p = .02. The model better explained 15.8% of the communication than the null model, and correctly classified 9% of cases. For every one-point increase above the average in MPJR risk perception, managers became four times more likely to communicate STF hazard awareness to employees than those with average or below average MPJR risk perceptions (OR = 4.07, 95% CI [1.18, 14.05]).

No manager perceptions of any category were significant predictors of whether a manager would: enact a policy, change a practice, initiate training, or initiate an information sharing program to prevent future hazards related to slips, trips, or falls. However, several forms of manager risk perceptions were all significant predictors of whether a manager would take preventative action against STFs *other than* putting in place a policy, changing a practice, initiating training, or using a new information-sharing practice (hereafter referred to as “alternative STF action”).

Manager PIT risk perception successfully predicted whether a facility would report using an information sharing program to prevent future STF hazards $\chi^2(1) = 4.74$, p = .029. The model explained 14.8% more of communication than the null model, but

correctly classified 0% of observed cases. For every one-point increase above the average in PIT risk perception, managers became two times more likely to implement an information sharing system for STF prevention than those with average or below average PIT risk perceptions (OR = 2.42, 95% CI [0.99, 5.91]).

Predicting MMH Manager Actions. No category of manager risk perceptions significantly predicted whether a manager would report: actively communicating to employees the importance of being aware of MMH hazards (or *how* they would communicate this), enact a policy, change a practice, or initiate training, prevent future hazards related to manual material handling.

However, manager MPJR risk perceptions significantly predicted whether a manager would implement an information sharing program to prevent MMH hazards $\chi^2(1) = 6.62$, $p = .01$. This model explained 23.2% more of whether a manager would launch an MMH information sharing program than the null model, but only correctly classified 17% of cases. According to this MPJR model, for every one-point increase in manager MPJR risk perception above the mean, the likelihood that a manager would implement an information sharing system to prevent MMH hazards decreased by 88% (OR = 0.125, 95% CI [0.02, 0.79]). Thus, only six of the one-hundred-fifty-four logistic regressions performed were significant (4%). See Table 16 for a visual review of the significant relationships supporting Hypothesis 1.

Table 16

Hypothesis 1 Significant Relationships

STF Communication:	Manager RP	χ^2	OR	95% CI Lower	95% CI Upper	R^2N	*p*
Y/N	Overall	4.17	6.77	.89	51.2	.181	.041
Y/N	MPJR	6.50	12.05	1.25	116.63	.277	.011
Demonstration	MMH	5.28	.54	.31	.94	.125	.02
Demonstration	PP	4.37	.57	.32	.99	.104	.037
Other	Overall	6.00	5.06	1.18	21.67	.165	.014
Other	MPJR	5.70	4.07	1.18	14.05	.158	.017
STF Action:							
Other	PIT	4.74	2.42	.99	5.91	.148	0.029
MMH Action:							
Information Sharing	MPJR	6.62	.125	.02	.79	.232	0.010

Relationship between Employee Risk Perception and Reporting

Hypothesis 2 also received support. A simple linear regression tested the relationship between employee overall risk perceptions and total reports $F(1, 181) = 5.88$, $p < .05$, $R^2 = .03$), finding a significant relationship. Employee overall risk perceptions were able to significantly predict reporting in Quarter 3 of 2021 $F(1, 186) = 8.49$, $p < .01$, $R^2 = .04$) and in Quarter 4 of 2021 $F(1, 186) = 6.70$, $p = .01$, $R^2 = .03$. Additional simple linear regressions found significant relationships between employee MPJR risk perceptions and reporting in Q3 of 2021 $F(1, 186) = 6.54$, $p = .01$, $R^2 = .03$, and reports in Q4 of 2021 $F(1, 186) = 3.97$, $p < .05$, $R^2 = .02$. There were no significant relationships between employee TRP and reporting.

Employee STF risk perception did not significantly predict reporting during or after the organization's quarterly STF focus, nor did employee MMH risk perception significantly predict reporting during or after the organization's quarterly MMH focus.

Means, standard deviations, and correlations are reported for employee risk perceptions and reporting data in Table 17.

Table 17

Means, Standard Deviations, and Correlations in Employee Risk Perceptions and Reporting

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Total Reports	13.6	13.1	—											
2. Q1 Reports	1.86	3.31	.67***	—										
3. Q2 Reports	3.3	4	.85***	.26***	—									
4. Q3 Reports	3.23	2.98	.90***	.31***	.92***	—								
5. Q4 Reports	3.06	3.21	.93***	.57***	.71***	.82***	—							
6. Q5 Reports	2.04	2.07	.94***	.69***	.71***	.76***	.91***	—						
7. Employee Overall RP	4.42	0.64	-.18*	-.13	-.13	-.21**	-.19*	-.1	—					
8. Employee MPJR RP	4.23	0.72	-.14	-.08	-.13	-.18*	-.15*	-.08	.80***	—				
9. Employee TRP RP	4.77	1.07	-.12	-.12	-.06	-.12	-.12	-.06	.70***	.14*	—			
10. Employee STF RP	4.76	1.1	-.07	-.1	-.01	-.06	-.07	-.02	.66***	.19**	.88***	—		
11. Employee MMH RP	4.69	1.2	-.11	-.11	-.05	-.11	-.11	-.05	.63***	.09	.94***	.81***	—	
12. Employee PP RP	4.88	1.17	-.1	-.12	-.02	-.09	-.11	-.05	.66***	.14*	.92***	.73***	.83***	—
13. Employee PIT RP	4.76	1.25	-.15*	-.11	-.12	-.16*	-.13	-.08	.60***	.09	.89***	.67***	.78***	.80***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Moderating Relationship of Manager Risk Perception on Employee Risk Perception and Reporting

Hypothesis 3 did not receive support. A general linear model regression was performed to assess the moderating relationship between employee risk perceptions, manager risk perceptions, and employee incident reporting behaviors. As previously

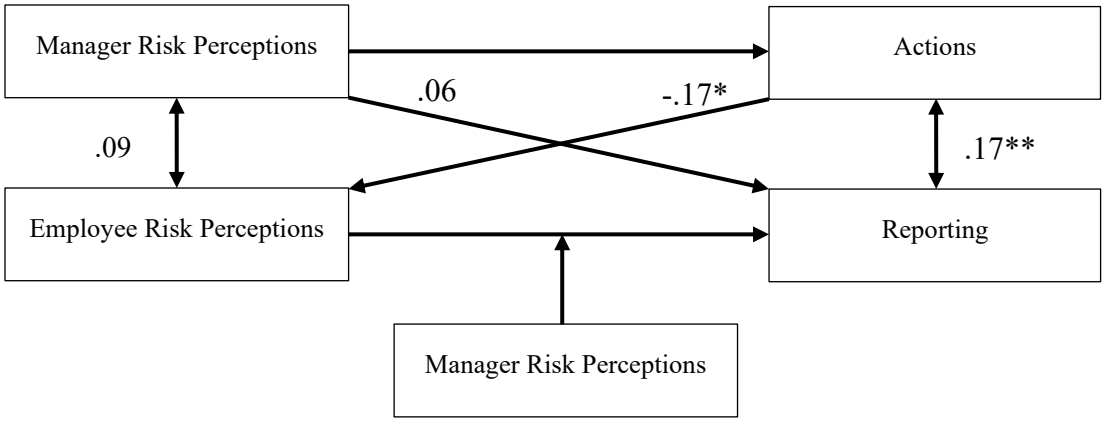
mentioned, overall employee risk perceptions significantly predicted total reports. However, manager overall risk perceptions $F(1, 179) = 2.52$, $p = .11$, $R^2 = .03$ did not significantly predict total reports, and neither did the interaction between employee and manager overall risk perceptions $F(1, 181) = 5.88$, $p = .19$, $R^2 = .03$. Further, manager MPJR risk perceptions $F(1, 179) = 1.75$, $p = .19$, $R^2 = .004$ also failed to predict total reporting, and the interaction between employee MPJR and manager MPJR risk perceptions was not significant either $F(1, 177) = .91$, $p = .34$, $R^2 = .02$. Finally, manager TRP risk perceptions could not successfully predict total reports $F(1, 179) = 3.30$, $p = .07$, $R^2 = .01$, and neither could the interaction between employee and manager TRP risk perceptions $F(1, 178) = 2.63$, $p = .11$, $R^2 = .02$.

Additional Planned Comparisons

Other relationships proposed in the Manufacturing Risk Perception and Behavior Model appear in Figure 4 showing significant correlations between Manager Actions and Employee Reporting (total actions and total reports by department; $r = .17$, $p < .01$) and, Manager Actions and Employee Risk Perception ($r = -.17$, $p < .05$).

Figure 4

Manufacturing Risk Perception and Behavior Model Correlations



Note. * $p < .05$, ** $p < .01$, *** $p < .001$; *Variables used include overall risk perceptions for both managers and employees, total reporting, and total actions.*

Forty-five other simple linear regressions were performed to measure manager risk perceptions' effects on employee risk perceptions. Three simple linear regressions were performed to explore the direct relationships between manager and employee risk perceptions of various categories (i.e., manager STF risk perceptions predicting employee STF risk perceptions). Manager overall risk perceptions did not significantly predict employee overall risk perceptions, nor could manager TRP predict employee TRP although the relationship did approach significance $F(1, 186) = 3.40$, $p = .07$, $R^2 = .01$. Manager MPJR risk perceptions successfully predicted employee MPJR risk perceptions $F(1, 186) = 5.29$, $p < .05$, $R^2 = .02$.

The other 42 simple linear regressions compared different manager risk perceptions against different employee risk perceptions to assess the impact of quarterly safety focus programs. Manager overall risk perceptions successfully predicted employee TRP risk perceptions $F(1, 186) = 5.89$, $p < .05$, $R^2 = .03$, employee MMH risk perceptions $F(1, 183) = 5.13$, $p < .05$, $R^2 = .03$, employee PP risk perceptions $F(1, 184) =$

7.72, $p < .05$, $R^2 = .04$, and employee PIT risk perceptions $F(1, 186) = 4.81$, $p < .05$, $R^2 = .02$. Additionally, manager TRP risk perceptions successfully predicted employee overall risk perceptions $F(1, 186) = 4.78$, $p < .05$, $R^2 = .02$. Manager STF risk perceptions successfully predicted employee overall risk perceptions $F(1, 186) = 4.45$, $p < .05$, $R^2 = .02$ and employee MPJR risk perceptions $F(1, 186) = 4.97$, $p < .05$, $R^2 = .02$. Manager MMH risk perceptions successfully predicted employee overall risk perceptions $F(1, 186) = 8.22$, $p < .01$, $R^2 = .04$, employee TRP risk perceptions $F(1, 186) = 7.79$, $p < .01$, $R^2 = .04$, employee STF risk perceptions $F(1, 185) = 5.04$, $p < .05$, $R^2 = .02$, employee MMH risk perceptions $F(1, 183) = 8.31$, $p < .01$, $R^2 = .04$, employee PP risk perceptions $F(1, 184) = 9.70$, $p < .01$, $R^2 = .04$, and employee PIT risk perceptions $F(1, 186) = 3.92$, $p < .05$, $R^2 = .02$. Manager PIT risk perceptions successfully predicted employee overall risk perceptions $F(1, 186) = 4.89$, $p < .05$, $R^2 = .03$, employee TRP risk perceptions $F(1, 186) = 5.26$, $p < .05$, $R^2 = .02$, employee MMH risk perceptions $F(1, 183) = 5.51$, $p < .05$, $R^2 = .02$, and employee PP risk perceptions $F(1, 184) = 9.18$, $p < .01$, $R^2 = .04$. See Table 18 for a complete list of these significant simple linear regressions.

Table 18

Manager Risk Perceptions Predicting Employee Risk Perceptions

Manager RP	Employee RP	Estimate	SE	95% CI Lower	95% CI Upper	*t*	Adjusted R^2	*p*
Overall	TRP	.64	.26	.120	1.16	2.43	.03	.016
	MMH	.68	.30	.087	1.26	2.265	.02	.025
	PP	.78	.29	.231	1.36	2.778	.04	.006
	PIT	.68	.31	.068	1.29	2.193	.02	.030
MPJR	MPJR	-.36	.16	-.662	-.051	-2.30	.02	.023
TRP	Overall	.19	.08	.018	.352	2.19	.02	.030
STF	Overall	.14	.06	.008	.263	2.11	.02	.036
	MPJR	.16	.07	.019	.310	2.23	.02	.027
MMH	Overall	.23	.08	.071	.384	2.87	.04	.005
	TRP	.38	.14	.110	.642	2.79	.04	.006
	STF	.32	.14	.038	.593	2.25	.02	.026
	MMH	.44	.15	.139	.742	2.88	.04	.004
	PP	.56	.15	.168	.747	3.11	.04	.002
	PIT	.32	.16	.001	.629	1.98	.02	.049
PIT	Overall	.13	.06	.014	.248	2.21	.02	.028
	TRP	.23	.10	.032	.429	2.29	.02	.023
	MMH	.27	.11	.043	.492	2.35	.02	.020
	PP	.33	.11	.115	.547	3.03	.04	.003

Additional Exploratory Analyses

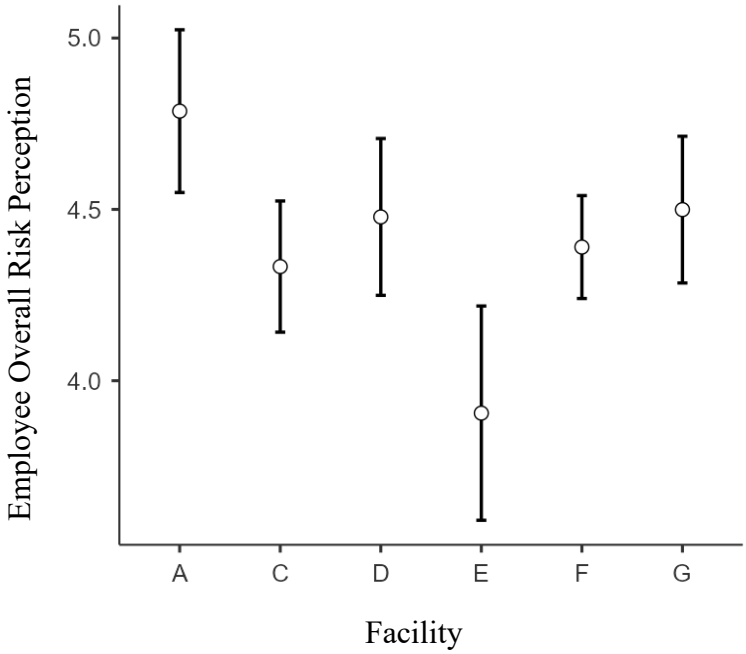
Seven analyses of variance (ANOVAs) determined there were no significant differences based on Spanish- vs. English- speaking employee respondents in risk perception of any category (i.e., overall, MPJR, TRP, STF, MMH, PP, or PIT).

Fourteen ANOVAs were run using facility as the grouping variable to compare employee and manager risk perceptions across plants. Two categories of employee risk perceptions were significant. Employee overall risk perceptions were significantly different across facilities $F(5, 200) = 4.34$, $p < .001$, $\eta^2 = .10$. Tukey's HSD Test for multiple comparisons was performed post hoc, finding significant differences between Facility A and Facility C ($p_{tukey} < .05$, 95% CI = [.24, 1.24], $d = .74$). Tukey's HSD also

found significant differences between Facility A and Facility E ($p_{tukey} < .001$, 95% CI = [.78, 2.09], $d = 1.44$), significant differences between Facility D and Facility E ($p_{tukey} < .05$, 95% CI = [.29, 1.57], $d = .93$), and significant differences between Facility E and Facility G ($p_{tukey} < .05$, 95% CI = [-1.59, -.34], $d = .97$). These findings demonstrate that employees at Facility E had significantly lower overall risk perceptions than those at other facilities. Please see Figure 5 for graphic representation of these differences.

Figure 5

Significant Between-Facility Differences in Employee Overall Risk Perception

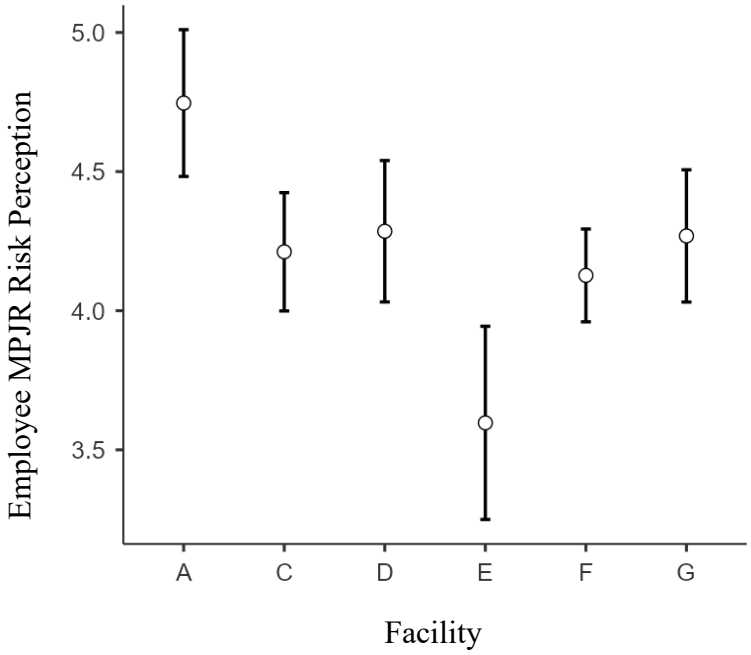


Employee MPJR risk perceptions were also significantly different across facilities $F(5, 200) = 5.93$, $p < .001$, $\eta^2 = .13$. Tukey's HSD Test for multiple comparisons was performed post hoc, finding significant differences between Facility A and Facility C ($p_{tukey} < .05$, 95% CI = [.28, 1.29], $d = .78$). Tukey's HSD also found significant differences between Facility A and Facility E ($p_{tukey} < .001$, 95% CI = [1.03, 2.35], $d = 1.69$), between Facility A and Facility F ($p_{tukey} < .01$, 95% CI = [.44, 1.38], $d = .91$),

between Facility C and Facility E ($p_{tukey} < .05$, 95% CI = [.30, 1.51], $d = .90$), between Facility D and Facility E ($p_{tukey} < .05$, 95% CI = [.37, 1.65], $d = 1.01$), and between Facility E and Facility G ($p_{tukey} < .05$, 95% CI = [-1.61, .36], $d = .99$). Once again, these findings demonstrate that employees at Facility E had significantly lower overall risk perceptions than those at other facilities. There were no significant differences among any category of manager risk perceptions across facilities. See Figure 6 for a graphic representation of this relationship.

Figure 6

Significant Between-Facility Differences in Employee MPJR Risk Perception



Finally, seven ANOVAs were performed with position as the grouping variable to compare average risk perceptions across levels of employment (managers vs. employees). There were no significant differences in overall, MPJR, or STF risk perceptions based on employment level. However, there were significant differences in TRP risk perception based on employment level $F(4, 274) = 3.4$, $p < .01$, $\eta^2 = .051$ Tukey's HSD Test for

multiple comparisons was performed post hoc, finding a significant difference between employment level 1 and 2 ($p_{tukey} < .05$, 95% CI = [-.83, -.15], $d = .49$), meaning that there was a significant difference between TRP risk perceptions of front-line-workers (i.e., production employees) and their immediate supervisors. Please see Figure 7 for a depiction of this difference in risk perception.

Figure 7

Significant Between-Employment Level Differences in TRP Risk Perception

Additionally, there were significant differences in MMH risk perceptions between levels of employment $F(4, 271) = 3.4$, $p = .01$, $\eta^2 = .048$. Tukey's HSD found that the mean value of average MMH risk perceptions was significantly different between front-line-workers and plant managers ($p_{tukey} = .05$, 95% CI = [-1.53, -0.25]), demonstrating that front-line-workers have significantly lower MMH risk perceptions than plant managers. Please see Figure 8.

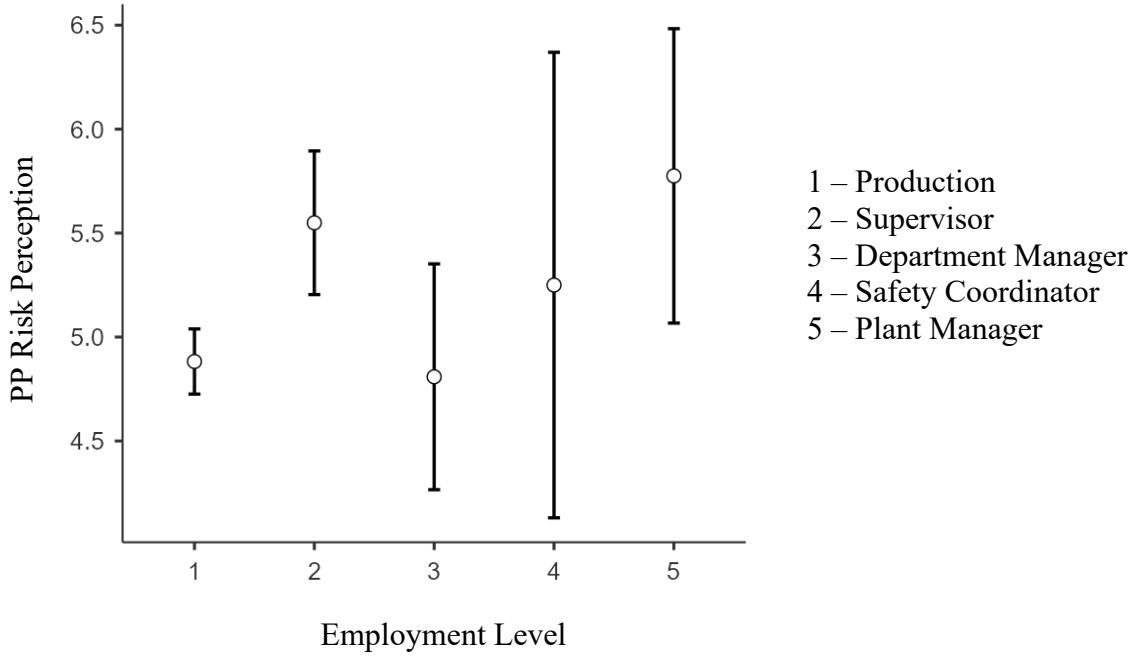
Figure 8

Significant Between-Employment Level Differences in MMH Risk Perception

There were also significant differences in PP risk perceptions $F(4, 272) = 4.3$, $p < .01$, $\eta^2 = .060$. Tukey's HSD found that the mean value of average PP risk perceptions was significantly different between front-line-workers and supervisors ($p_{tukey} < .01$, 95% CI = [-0.92, -0.25]), indicating that front-line-workers had significantly lower PP risk perceptions than their supervisors. Please see Figure 9.

Figure 9

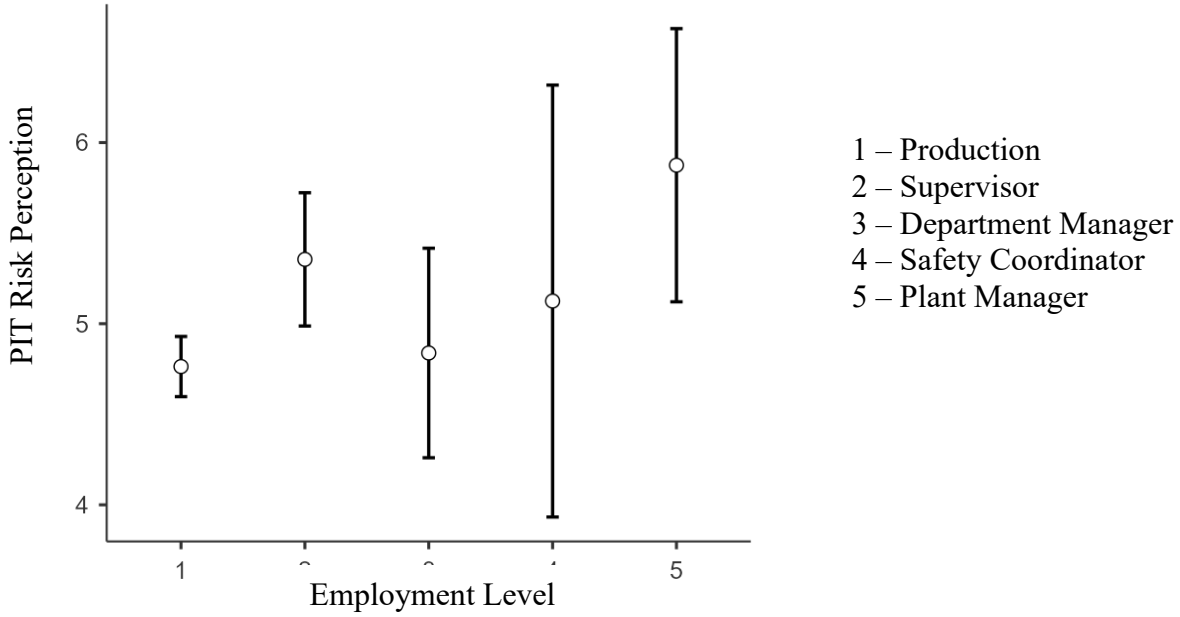
Significant Between-Employment Level Differences in PP Risk Perception



Finally, there were significant differences in PIT risk perceptions between levels of employment F(4, 274) = 3.8, p <.01, η^2 = .053. Tukey's HSD found that PIT risk perceptions were significantly different between front-line-workers and supervisors (p_{tukey} <.05, 95% CI = [-0.82, -0.15]). Tukey's HSD also found that the mean value of average PIT risk perceptions was significantly different between front-line-workers and plant managers (p_{tukey} <.05, 95% CI = [-1.56, -0.28]). These analyses reveal that front-line-workers have significantly lower risk perceptions than both supervisors *and* plant managers. Please see Figure 10 for graphic representation of these differences.

Figure 10

Significant Between-Employment Level Differences in PIT Risk Perception



Discussion

This study gives insight into the dynamic relationship between front-line-employee and manager risk perceptions, and how the risk perceptions and behaviors of one level may influence another. Hypothesis 1 was supported showing a significant relationship between manager risk perceptions and their actions to mitigate risk. The higher manager risk perceptions tended to be, the higher the number of mitigation actions were reported. Logistic regressions testing this relationship showed manager overall risk perceptions predicted the actions to mitigate STF hazards in their workplace. Aside from overall risk perceptions, manager MPJR risk perceptions also predicted many different preventive actions aimed at mitigating STF and MMH risks. The fact that manager TRP-

STF risk perceptions were unable to successfully predict any manager actions speaks to the possibility that risk perceptions of specific hazards do not necessarily translate into behaviors to address those specific hazards. Oddly, TRP-MMH, PP, and PIT subscales were able to predict actions taken to mitigate STF hazards.

These findings suggest it is possible that approaching an individual's holistic risk perceptions may be more effective than targeting risk perception specific to certain hazards. Is it possible, then, that an individual's personal experiences with risk may be more influential in promoting actions taken to mitigate future risk? Research investigating preventative measures in safety has highlighted the importance of individual psychological factors, concluding that corporate safety initiatives should emphasize structural and psychological change (Runyan, 1993). Thus, it is likely that bolstering the results of this study with additional contextual variables (such as individual demographic information) would shed light on when and what action a manager might take to mitigate future risk for their employees.

It is important to note that the majority of significant actions were STF awareness communication actions. Further, the only STF prevention action was one unrelated to the ones proposed by SMEs in FCA development, and the only MMH prevention action was the implementation of an information sharing system. With communication occurring disproportionately more than actual hazard mitigation, we can conclude that risk perceptions led to verbal changes, but sustainable environmental systems (e.g., policy, practice, etc.) were not evidenced. It is also possible that the managers in this study did not have the resources necessary to implement change they felt would best suit their

employees, or they made changes outside the measurement confines of the organization's FCA.

That said, only six of the one-hundred-fifty-four logistic regressions performed were significant (4%). This begs the question whether these six logistic regressions are the result of Type I error.

Hypothesis 2 was also supported: there was a significant relationship between employee risk perceptions and employee reporting behaviors. Employee overall risk perceptions were successful in predicting total reports, Q3 of 2021 reports, and Q4 of 2021 reports, while employee MPJR risk perceptions were successful in predicting Q3 of 2021 reports. Once again, overall and MPJR (holistic) risk perceptions proved to be the most consistent in predicting outcomes, supporting the idea that holistic risk perceptions may be more effective than those specific to certain hazards. Certainly, manufacturing companies will continue to launch initiatives to address workplace hazards as extraordinary incidents arise, as a sort of "band-aid" solution, but these instances are likely more than one standard deviation away from baseline incidents reported. That is, they will focus specifically on encouraging hazard avoidance of a specific variety in response to a safety incident's occurrence, even though that hazard is not frequently associated with facility incidents. However, this research suggests that doing so will not necessarily result in any lasting behavior change within the employees' environment. As such, corporate safety initiatives should likely encourage more total and holistic situational hazard awareness in employees, rather than on specific hazards alone.

A number of factors contribute to an individual's risk perceptions and behavioral responses to risk (Rundmo, 2001). While hazards and near miss incidents are certain to

exist in a manufacturing environment, it is possible that some employees do not feel the need to report these occurrences if they do not perceive them to be of sufficient risk. Further, employees may not report on incidents if the cost of reporting outweighs the cost of simply avoiding the hazard, or if they anticipate management repercussions. Additionally, employees may not report hazards or even incidents, despite having high risk perceptions, if they do not perceive that management will take action to prevent the hazard/incident's reoccurrence. This may explain the unanticipated negative correlations between employee risk perceptions and reporting (Table 17). Certainly, just as risk perceptions may contribute to risk behaviors, previous research has suggested that reporting behaviors are influenced by the perceptions of the reporting party (Reznek & Barton, 2014).

Hypothesis 3 was unsupported: manager risk perceptions did not moderate the relationship between employee risk perceptions and employee reporting behaviors; nor did manager risk perceptions of any category successfully predict employee reporting. However, upon examining the statistical analyses, it appears that these analyses are trending strongly. As a result, additional statistical power would likely be beneficial in further exploration of these variables. This statistical power may come in many forms, and it is possible that it already exists in uncollected employee reporting. Indeed, this statistical power may have been compromised by the aggregation of multiple levels of employment to represent "manager" risk perceptions. The inclusion of department managers, plant managers, and safety coordinators in a value to predict or correlate with risk perceptions of front-line workers in specific departments may have acted as a contaminant to the sample's predictive capabilities. As such, were this study to be

replicated, response pairings should only be made between front-line workers and their direct supervisors, thereby lending greater statistical power through their shared proximal environments. To do this, however, greater responding is required on the part of management.

To the best of our knowledge, manager and employee risk perceptions have never been measured concomitantly in this way, nor has one ever been used to predict the other. This study has demonstrated that employee and manager risk perceptions are related. However, the host organization and its unique safety culture as the context for this study is likely to have influenced our results. According to Table 15, employee overall risk perceptions are only somewhat positively correlated with manager TRP risk perception ($r = .16$, $p < .05$), that employee TRP risk perceptions are somewhat positively correlated with manager overall risk perceptions ($r = .18$, $p < .05$). However, contradicting these positive correlations, employee MPJR risk perception is somewhat negatively correlated with manager MPJR risk perceptions ($r = -.17$, $p < .05$). This, coupled with the fact that exploratory ANOVAs found significant differences between front-line employees and their supervisors' mean risk perceptions suggests that risk perception-influencing strategies at the organization function largely as a top-down process. Indeed, a process that does not quite reach the bottom of the hierarchy.

Manager risk perceptions of various categories were able to predict 18 instances of employee risk perceptions (see Table 18). Further, additional exploratory ANOVAs suggest that front-line employees typically had lower risk perceptions than their supervisors and plant management. It is possible that higher-level managers have higher risk perceptions in general, as they reside on the clerical end of incident outcomes.

Employees are likely able to establish emotional and hypothetical psychological distance (Huang et al., 2019; Knuth et al., 2014) because incident(s) did not happen to them, instead they happened to someone else in the plant, someone they might not even know. But plant managers must interact in some way with every single incident that occurs within their facility.

Low employee overall risk perceptions may also be a result of dissatisfaction with their managers, as according to Rundmo (1995, 1996), satisfaction with management is positively correlated with perceived risk. As previously discussed, affective components change the way one perceives risk (Rundmo, 1995; Slovic et al., 2005). Indeed, if an individual *likes* a process and sees it as beneficial, they are more likely to perceive the risks as low, than if they *disliked* the process (Slovic et al., 2005). Further, managers might also have higher risk perceptions because they are aware of processes that need to change but may not have the resources to make the changes necessary—thereby incurring negative affect (dislike).

Manager MMH risk perceptions were able to predict the most employee risk perceptions when comparing across TRP subscales (see Table 18). Given the fact that the organization's MMH safety focus initiative had been delivered within one quarter of risk perception survey administration, it appears that manager MMH was significantly affected by the initiative. Thus, even though manager MMH risk perceptions only resulted in 2 predicted actions (see Table 16), there was still an effect. It is also possible that because of the timing of risk perception survey implementation occurring immediately after the organization's MMH focus initiative, managers had not yet had the opportunity to implement preventative MMH measures.

That said, great multicollinearity was demonstrated between the factors on the TRP (see Table 14). Considering this finding alongside the consistent predictive capabilities of the MPJR and "overall" risk perceptions at predicting employee risk perceptions, it begs the question of whether these individual factors, and therefore hazards, should be considered for use. The determinant for which risk perception measure to retain is the specificity to which one intends to measure specific risk perceptions, and the purpose for measurement. If an organization were attempting to ascertain a holistic understanding of how its employees perceive risk, the TRP and any of its subscales would not be necessary. Inversely, if an organization wanted to measure employee commitment to hazard information seeking and planning, the TRP would prove far more useful than the MPJR.

Further, considering STF and MMH risk perceptions (collected after each of their respective quarterly safety focus initiatives were delivered) were unable to consistently predict STF and MMH preventative actions, it is possible that risk perceptions of specific hazards diminish over time. This speaks to the possibility that when individuals initially develop a perception of a risk, or when they are exposed to information pertaining to previously-assessed risks, there may be a "decaying" or attenuation effect as they create greater hypothetical and/or emotional psychological distance. That is, the more time that passes after an individual assesses a particular risk, the more they may rely on cognitive processes (i.e., psychological distance) to make the risk seem further from themselves. This may even be especially true when a safety incident occurs in a facility or department, and the individual attributes the incident to the person it affected or the situation itself, rather than assessing the risk with the potential to happen to them as well.

Research suggests that it is important to assess employee risk perceptions to enhance safety, as the actions taken both by employees and management directly affect levels of perceived risk (Rundmo, 1995, 1996, 2001; Rundmo & Hale, 2003). This research, in addition to the findings of this study, strongly suggest that further research is necessary to fully understand the interplay between risk perceptions and behaviors across multiple employment levels.

Limitations and Future Research

There are several limitations to consider in the context of the current study. As risk perceptions and manager actions were only measured at one point in time, it is difficult to ascertain whether the actions managers took were a *result* of their risk perceptions, or whether they were a *precursor* to risk perception development or related to a third variable such as corporate safety initiatives. Had this study been able to establish a baseline of risk perceptions, the relationship between both employee and manager risk perceptions and manager actions would be rendered much clearer. Additionally, were risk perceptions measured across multiple points in time, the relationship between manager risk perceptions and reporting may be more closely examined.

Another limitation to consider involves the system of measurement used to assess risk perception itself. Hourly employees completed their risk perception surveys on-shift during their production time, and considering the likelihood that many manufacturing employees are compensated at a piecemeal rate, it is possible they rushed completion of the measures.

Further, the evaluation of risk and risk elements is a largely cognitive, and therefore subjective, process. As such, subjective risk perceptions are typically studied and analyzed through a psychometric paradigm (Ivensky, 2016; Sjöberg, et al., 2004; Slovic, et al., 1981). A consideration in using psychometric design to measure risk perception lies in the wording of the risk perception question(s)—particularly because, as previously discussed, risk perception has been found to be both protective and reflective (Knuth et al., 2014; Mills et al., 2008; Sjöberg et al., 2004; Stephenson et al., 2021; Wilson et al., 2019). Mills et al. (2008) accredit the inconsistencies of risk perception and risk behavior relationships observed in research to how question cues elicit different representations of risk from diverse participants (i.e., risk takers vs. risk avoiders). Thus, items with specific behavior cues can help put participants in the mindset where risk perception is either protective or reflective. It is possible that the adaptations made to use the HEPJR in a manufacturing context did not afford respondents sufficient environmental or occupational cues to elicit accurate representations of risk. As such, it is imperative that future items measuring manufacturing risk perceptions be formatted with enough specificity and employees given a set amount of time to elicit accurate risk representations from respondents.

Another potential limitation to the risk perception measures used is the lack of measurement of respondents' personal incident history. An individual's previous experiences with risk are another component thought to be important to developing risk perceptions (Eklöf & Törner, 2002; Rundmo, 2001; Stein et al., 2013). Research quantifies accident experience as an individual's personal contact with an accident or injury, personal contact with a near miss, or exposure to situations where someone else

was injured (Eklöf & Törner, 2002). Individuals who have experienced a safety incident tend to be somewhat less likely to take risks than those who have not experienced personal incidents (Kouabenan, 2002).

While an individual's direct experience can affect their perceptions of risk, there are other—more indirect—experiences through which an individual can have a relationship with risk. In occupational safety, an incident does not always have to happen *to* employees for them to be affected in some way or for them to develop risk perceptions about a hazard. Experiences with risk, whether direct or indirect could, in theory, be expected to motivate management to seek out or make improvements to occupational safety processes.

A study by Eklöf & Törner (2002) found that, among 92 Swedish fisherman, there was no correlation between safety incident experience and activity to improve safety. This implies that respondents did not seek forms of change to enhance accident control *because of* their previous accident experience. The study actually found that the perceived manageableness of risks is what positively correlated with activities to improve safety. Similarly, research suggests that there are different circumstances in which people will tolerate more risk or otherwise minimize the risk they perceive, such as when they are engaging in a voluntary behavior or when they believe they are in control (McKenna, 1993; Sjöberg et al., 2004).

This research, when considered together, highlights the important implications of making employees feel like they can manage the risks of their job(s), giving them safety training, and ensuring a supportive co-worker environment (Eklöf & Törner, 2002; McKenna, 1993; Sjöberg et al., 2004). These findings suggest that employees may be

motivated to take steps toward improving safety if incidents are cooperatively analyzed and made more manageable. Thus, future campaigns to enlighten employees on the dangers of a hazard should likely focus less on simply delivering rhetoric such as “X is dangerous, and X will happen if you aren’t careful,” and focus more on messages like “this is how you can safely manage the risks of this hazard,” ensuring that this information comes from a source perceived as credible by employees (Stein et al., 2013).

Misjudging the risks associated with occupational hazards is dangerous to employee safety for a number of reasons, especially in manufacturing contexts. It is the responsibility of management to accurately assess risks, and establish preventative means to protect employees, just as it is the responsibility of employees to report risks and incidents. By gaining a deeper understanding of the factors that affect risk perception, how risk perceptions affect behaviors, and how risk-perception-motivated behaviors affect others, we may be able to drastically influence safety-related behaviors, and keep employees safe.

References

Eklöf, M., & Törner, M. (2002). Perception and control of occupational injury risks in fishery—a pilot study. *Journal of Work & Stress, 16*(1), 58–69. Doi: 10.1080/02678370110114694

Hansen, J., Rim, S., & Fiedler, K. (2013). Psychological distance and judgments of causal impact. *Journal of Experimental Social Psychology, 49*(6), 1184–1189.

Huang, L., Wu, C., Wang, B., Ouyang, Q., & Lin H. (2019). An unsafe behavior formation mechanism based on risk perception. *Human Factors Management, 29*(2), 109–117. Doi: 10.1002/hfm.20762

Ivensky, V. (2016). Managing risk perceptions: Safety program support outcomes. *Professional Safety, 61*(8), 44–50.

Kessels-Habraken, M., De Jonge, J., Van der Schaaf, T., & Rutte, C. (2010). Prospective risk analysis prior to retrospective incident reporting and analysis as a means to enhance incident reporting behavior: A quasi-experimental field study. *Social Science and Medicine, 70*, 1309–1316. Doi: 10.1016/j.socscimed.2010.01.035

Knuth, D., Kehl, D., Hulse, L., & Schmidt, S. (2014). Risk perception, experience, and objective risk: A cross-national study with European emergency survivors. *Risk Analysis*, *34*(7), 1286–1298. Doi: 10.1111/risa.12157

Kouabenan, D. R. (2002). Occupation, driving experience, and risk and accident perception. *Journal of Risk Research, 5*(1), 49-68.

Liberman, N., & Trope, Y. (2008). The psychology of transcending the here and now. *Science, 322*, 1201–1205.

Lingard, H., Cooke, T., & Blismas, N. (2012). Do perceptions of supervisors' safety responses mediate the relationship between perceptions of the organizational safety climate and incident rates in the construction supply chain? *Journal of Construction Engineering and Management*, *138*(2), 234–241.

McKenna, F. P. (1993). It won't happen to me: Unrealistic optimism or illusion of control? *British Journal of Psychology*, *84*, 39-50.

Mills, B., Reyna, V. F., & Estrada, S. (2008). Explaining contradictory relations between risk perception and risk taking. *Psychological Science*, *19*(5), 429–433.

National Institute for Occupational Safety and Health. (2021, January 26). *Mining topic: Manual materials handling*. U.S. Department of Health and Human Services. https://www.cdc.gov/niosh/mining/topics/manualmaterialshandling.html

Phimister, J. R., Oktem, U., Kleindorfer, P. R., & Kunreuther, H. (2003). Near-miss incident management in the chemical process industry. *Risk Analysis 23*(3), 445–459. http://dx.doi.org.proxy006.nclive.org/10.1111/1539-6924.00326

Reznek, M. A., & Barton, B. A. (2014). Improved incident reporting following the implementation of a standardized emergency department peer review process. *International Journal for Quality in Health Care*, *26*(3). 278 – 286. Doi: 10.1093/intqhc/mzu045

Rundmo, T. (1995). Perceived risk, safety status, and job stress among injured and noninjured employees on offshore petroleum installations. *Journal of Safety Research, 26*(2), 87–97.

Rundmo, T. (1996). Changes in risk perception among North Sea offshore personnel in the period 1990 to 1994. *Safety Science 21,* 205–221.

Rundmo, T. (2001). Employee images of risk. *Journal of Risk Research, 4*(4), 393–404. Doi: 10.1080/13669870110065325

Rundmo, T., & Hale, A. R. (2003). Managers' attitudes towards safety and accident prevention. *Safety Science, 41*, 557–574.

Runyan, C. W. (1993). Progress and potential in injury control. *American Journal of Public Health, 83*, 367–639.

Sjöberg, L., Moen, B.-E. & Rundmo, T. (2004). Explaining risk perception: An evaluation of the psychometric paradigm in risk perception research (Report No. 84). Trondheim, Norway: Rotunde publikasjoner. Retrieved from www.svt.ntnu.no/psy/torbjorn.rundmo/ psychometric_paradigm.pdf.

Slovic, P. (1999). Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis*, *19*(4), 689–701.

Slovic, P., Fischhoff, B. & Lichtenstein, S. (1981). Facts and fears: Societal perception of risk. *Advances in Consumer Research*, 8, 497–502.

Slovic, P., Peters, E., Finucane M. L., & MacGregor, (2005). Affect, risk, and decision making. *Health Psychology, 24*(4), S35–S40. Doi: 10.1037/0278-6133.24.4.S35

Stein, R., Buzcu-Guven, B., Dueñas-Osorio, L., Subramanian, D., & Kahle, D. (2013). How risk perceptions influence evacuations from hurricanes and compliance with government directives. *The Policy Studies Journal, 41*(2), 319–342.

Stephensen, M., Schulze, C., Landrø, M., Hendrikx, J., & Hetland, A. (2021). Should I judge safety or danger? Perceived risk depends on the question frame. *Journal of Experimental Psychology: Applied, 27*(3), 485–502. https://doi.org/10.1037/xap0000354

Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review, 110*(3), 403–421.

Wilson, R. S., Zwickle, A., & Walpole, H. (2019). Developing a broadly applicable measure of risk perception. *Risk Analysis, 39*(4), 777–791. Doi: 10.1111/risa.13207

Xie, C., Zhang, J., Chen, Y., Morrison, A. M., & Lin, Z. (2020). Measuring hotel employee perceived job risk: Dimensions and scale development. *International Journal of Contemporary Hospitality Management*, *32*(2), 730–748. Doi: 10.1108/IJCHM-01-2019-0022

Appendix A

Appalachian State University IRB Exemption Status Letter

Mountaineer APPS

Catherine Parks <parksce@appstate.edu>

[External] IRB Notice - 22-0099

1 message

IRB <irb@appstate.edu> Wed, Feb 2, 2022 at 1:47 PM
To: ludwigtd@appstate.edu, parksce@appstate.edu

To: Catherine Parks
Psychology
CAMPUS EMAIL

From: IRB Administration
Date: 2/02/2022
RE: Notice of Exempt Research Determination
Agrants #:
Grant Title:

STUDY #: 22-0099
STUDY TITLE: Risk Perception's Effects on Manufacturing Management's Safety Policy Implementation

Exemption Category: 2.Survey, interview, public observation

NOTE: This project, like all exempt and non-exempt research with human subjects at Appalachian State University, is subject to other requirements, laws, regulations, policies, and guidelines of Appalachian State University and the state of North Carolina. As of August 26, 2021 and until further notice, this includes additional requirements for protections against COVID-19. Please go here for the additional requirements that you must fulfill.

This study involves no more than minimal risks and meets the exemption category or categories cited above. In accordance with the 2018 federal regulations regarding research with human subjects [45 CFR 46] and University policy and procedures, the research activities described in the study materials are exempt from IRB review.

What an exempt determination means for your project:

1. The Office of Research Protections staff have determined that your project constitutes research with human subjects, but that your research is exempt from the federal regulations governing human subjects research, per 45 CFR 46.104.
2. Because this research is exempt from federal regulations, the recruitment and consent processes are also exempt from Intuitional Review Board (IRB) review. This means that the procedures you described and the materials you provided were not reviewed by the IRB, further review of these materials are not necessary, and that you can change the consent procedures without submitting a modification.
3. **You still need to get consent from adult subjects and, if your study involves children, you need to get assent and parental permission.** At the very least, your consent, assent, and parental permission processes should explain to research subjects: (a) the purpose, procedures, risks, and benefits of the research; (b) if compensation is available; (c) that the research is voluntary and there is no penalty or loss of benefits for not participating or discontinuing participation; and (d) how to contact the Principal Investigator (and the Faculty Advisor if the PI is a student). You can also use exempt research consent template, which accounts for all of these suggested elements of consent: https://researchprotections.appstate.edu/human-subjects-irb/irb-forms. **Please note that if your consent form states that the study was "approved by the IRB" this should be removed. You can replace it with a sentence that says that the study was determined to be exempt from review by IRB Administration. In addition, be sure that the number you have listed for the IRB is 828-262-2692**
4. **Special procedures and populations for which specific consent language is suggested.** Research involving children, research that uses the SONA database for recruitment, research with students at Appalachian State University, or research that uses MTurk for recruitment should use the specific language outlined by The Office of Research Protections on our website.
5. **Study changes that require you to submit a modification request**: most changes to your research will not

require review by the Office of Research Protections. However, the following changes require further review by our office:

- the addition of an external funding source;
- the addition of a potential for a conflict of interest;
- a change in location of the research (i.e., country, school system, off site location);
- change in contact information for the Principal Investigator,
- the addition of non-Appalachian State University faculty, staff, or students to the research team, or
- **Changes to study procedures.** If you change your study procedures, you may need to submit a modification for further review. Changes to procedures that may require a modification are outlined in our SOP on exempt research, a link to which you can find below. Before submitting a modification to change procedures, we suggest contacting our office at irb@appstate.edu or (828) 262-2692 to confirm whether a modification is required.

Investigator Responsibilities: All individuals engaged in research with human participants are responsible for compliance with University policies and procedures, and IRB determinations. The Principal Investigator (PI), or Faculty Advisor if the PI is a student, is ultimately responsible for ensuring the protection of research participants; conducting sound ethical research that complies with federal regulations, University policy and procedures; and maintaining study records. The PI should review the IRB's list of PI responsibilities.

To Close the Study: When research procedures with human participants are completed, please send the Request for Closure of IRB Review form to irb@appstate.edu.

If you have any questions, please email IRB@appstate.edu or contact the Director of Research Protections at (828) 262-2692.

Best wishes with your research.

Important Links for Exempt Research:

Note: If the link does not work, please copy and paste into your browser, or visit https://researchprotections.appstate.edu/human-subjects.

1. Standard Operating Procedure for exempt research (#9): https://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/sop_9_approved_1.21.2019.pdf

2. PI responsibilities: https://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI%20Responsibilities.pdf

3. IRB forms: http://researchprotections.appstate.edu/human-subjects/irb-forms

Appendix B

Memorandum of Understanding with Host Organization

[redacted]

December 6, 2021

Timothy D. Ludwig, Ph.D.
Department of Psychology
Appalachian State University
Boone, NC 28608

Dear Dr. Ludwig,

I represent [redacted] as Vice President of Environmental Health and Safety and Sustainability. We have reviewed the research proposal that you and Catherine Parks have submitted, and we believe that our participation in the research outlined in the proposal will be beneficial to the safety of our employees. I am satisfied that we can build a good working relationship with the research staff to help carry out the proposed project.

Therefore, we agree to participate in the project outlined in the research proposal.

As participants we would agree to:

- Allow the research team to work with our management and safety committees to administer a risk perception survey to front-line leaders, departmental and plant managers, and safety coordinators.
- Provide the research team with employee records and allow the research team to interview, survey, and conduct intervention meetings with employees.
- Provide the research team with employee injury and incident report data.
- Provide the research team with records of company-wide safety initiatives, and preventative actions taken by management at our U.S. plants.

As the research team conducts these projects we understand that:

- All data will be confidential so that no employee or company can be identified by anyone other than the research team.
- Employee participation in this project is strictly voluntary and not a condition of employment at [redacted] There are no contingencies for employees who choose to participate or decline to participate in this project.

- Data collected from [redacted] will not be distributed outside the research team unless otherwise authorized by [redacted]
- All data will be secured by password protection, VPN encryption, and other necessary security.
- [redacted] may adapt their participation or withdrawal from the project at any time due to business necessity or other concerns.
- [redacted] will be able to review and make comments on any reports generated from this research.
- If desired, [redacted] will be recognized on all reports generated for its participation in the research.

Evidence-based decisions and safety behaviors are a priority at [redacted] We would be proud to be part of a team whose goal it is to design a process that seeks to improve the processes we currently have in place. It is our hope that we might be successful and this process may be used to help improve the decisions and behaviors of many of our fellow manufacturers.

Please contact us at [redacted] if there are any further questions.

Sincerely,

[redacted]

[redacted]
Vice President of Environmental Health and Safety and Sustainability
[redacted]

Appendix C

Study Consent Form

APPALACHIAN STATE UNIVERSITY

CONSENT FORM

RISK PERCEPTION SURVEY

Researchers: Catherine Parks (PI), M.A. Candidate, Industrial/Organizational Psychology and Human Resource Management.
Email: parksce@appstate.edu
Phone: [redacted]
Faculty Advisor: Timothy Ludwig, PhD, Professor, Department of Psychology
Email: ludwigtd@appstate.edu
Phone: [redacted]

Researchers Statement:
We are asking you to be in a research study. This form gives you information to help you decide whether or not to be in the study, such as the purpose of study; the procedures, risks, and benefits of the study; how we will protect the information we will collect from you; and how you can contact us with questions about the study or if you feel like you have been harmed by this research. Please read it carefully. Being in the study is voluntary, and even after you agree to participate, you can change your mind and stop participating at any time.

PURPOSE OF THE STUDY

The purpose of this study is to understand some of the thought processes behind the decisions that affect safety at Elevate Textiles. We are assessing how employees at Elevate feel about the safety environment around them and what they do when they feel concerned.

Approximately 300 people will be included in the study including front line workers, supervisors and managers.

STUDY PROCEDURES

This study involves completing a survey where you will be asked to complete the survey on a work computer at your facility, and will take about 15 to 30 minutes to complete. The survey does not have any personal or invasive questions, and will ask you how much you agree with some statements about safety in your facility and some of the things you plan to do to keep yourself and/or others safe.

You may refuse to answer any question or item in the questionnaire at any point.

RISKS, STRESS, AND DISCOMFORTS

This survey will ask for identifying information such as your plant name, department and category of employment (hourly, supervision, department management, plant management). We need this information to link your response to other safety measures at your plant.

In the unlikely event that there is a breach of confidentiality, it is possible that your name and your opinions on safety within your facility may be revealed. Therefore, Elevate Textiles has signed an agreement that states your responses will be confidential and only viewed by the external research team. They also agreed that no one at Elevate can experience a negative job outcome based on our research. In other words, your participation in this study and any of your responses cannot be used against you in your work. Any data that Elevate management reviews will be aggregated not include any of your identifiable information on it.

We hope that these assurances will allow you to answer the surveys honestly without fear of repercussions.

BENEFITS OF THE STUDY

The benefits to society we expect to come from this study are that better understanding of how risk perceptions relate to active safety behaviors may inform safety decisions and initiatives to keep people safe in manufacturing jobs.

The benefits we expect your company will receive from this study are insights into employee attitudes about the risks they are exposed to on the job and how Elevate's safety management systems may best respond.

PROTECTION OF RESEARCH INFORMATION

Any responses we collect from you will remain confidential. Your data, once collected, will be stored with identifiers. This data will be protected using University-protected storage and computers, and encryption.

The research team (listed above) are the only persons who will have access to the identifiable data. Government or university staff sometimes review studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your identifiable data may be examined.

USING YOUR DATA IN FUTURE RESEARCH

The information we obtain from you for this study might be used for future studies. We will remove anything that might identify you. If we do so, that information may then be used for future research studies or given to another investigator without additional permission from you.

RESEARCH-RELATED HARMS

In the event of a study-related injury, illness, harm, or distress please contact Dr. Timothy Ludwig (ludwigtd@appstate.edu; Phone: [redacted] or Catherine Parks (parksce@appstate.edu; Phone [redacted]

By signing this document, you are not waiving any legal rights that you have to act against Appalachian State University for harm or injury resulting from negligence of the University or its investigators.

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Your participation in this research is completely voluntary. If you choose not to participate, there will be no penalty and you will not lose any benefits or rights you would normally have.
If you choose to take part in the research, you can change your mind at any time and stop participating. If you agree to participate but decide later that you don't want to be in this study, please stop completing the survey and let the researcher know. If you have questions or concerns about your rights as someone taking part in research, please contact the Appalachian State University Office of Research Protections at **828-262-4060** or **irb@appstate.edu**.

Participant's Name (PRINT) Signature Date

Appendix D

Slip, Trip, and Fall (STF) Quarterly Focus Safety Program

What is a fall hazard? A fall hazard is anything that could cause an employee to lose their balance or lose bodily support that results in a fall. Where do fall hazards exist? Fall hazards exist on any walking or working surface that employees are exposed to during a work shift. Walking-working surface means any horizontal or vertical surface on or through which an employee walks, works, or gains access to a work area or workplace location. A platform means a walking-working surface that is elevated above the surrounding area.

As an employer we are required to assess the workplace to determine whether the walking/working surfaces that employees are exposed to are free of STF hazards and are strong and structurally sound enough to safely support them as they work. This requirement extends to every employee of [redacted].

US OSHA Standard: Walking-Working Surfaces apply to all permanent places of employment. Other countries have similar requirements and standards in place. These standards guide our approach to STF hazards at [redacted].

> ***1910.22(a)(1)*** All places of employment, passageways, storerooms, service rooms, and walking-working surfaces are kept in a clean, orderly, and sanitary condition.
>
> ***1910.22(a)(2)*** The floor of each workroom is maintained in a clean and, to the extent feasible, in a dry condition. When wet processes are used, drainage must be maintained and, to the extent feasible, dry standing places, such as false floors, platforms, and mats must be provided.
>
> ***1910.22(a)(3)*** Walking-working surfaces are maintained free of hazards such as sharp or protruding objects, loose boards, corrosion, leaks, spills, snow, and ice.
>
> ***1910.22(b)*** Loads. The employer must ensure that each walking-working surface can support the maximum intended load for that surface.
>
> ***1910.22(c)*** Access and egress. The employer must provide, and ensure each employee uses, a safe means of access and egress to and from walking-working surfaces.
>
> ***1910.22(d)(1)*** Walking-working surfaces are inspected, regularly and as necessary, and maintained in a safe condition.
>
> ***1910.22(d)(2)*** Hazardous conditions on walking working surfaces are corrected or repaired before an employee uses the walking-working surface again. If the correction or repair cannot be made immediately, the hazard must be guarded to prevent employees from using the walking-working surface until the hazard is corrected or repaired; and
>
> ***1910.22(d)(3)*** When any correction or repair involves the structural integrity of the walking-working surface, a qualified person performs or supervises the correction or repair.

Most common, everyday falls often seem minor and may not result in any serious injury. When you think of workplace falls, dramatic falls from higher elevations come to mind. Falls from higher elevations most likely result in serious or fatal injuries. Some industries pose a greater risk for falls; the construction industry dominates the statistics for fatal workplace falls. Construction workers are

also at a greater risk of non-fatal falls due to the nature of their work. However, during a workday, anyone can slip, trip, or fall anywhere under a broad range of conditions, even in the seemingly benign office setting. These falls can and do result in serious injuries, including broken bones, back injuries and head injuries. For example, using a ladder to change a light bulb can result in a fall with serious injuries. Falling while stepping off a raised platform can result in a broken wrist.

Who falls?

Anyone can slip, trip and fall, and they do so under various conditions and circumstances. It is a fact that walking-working surfaces found in our facilities lend themselves to potential fall conditions (water, grease, lube, or debris are more likely to be on the floor and walking surfaces.)

What makes falling so hazardous?

When you fall, generally you do not think about what is happening other than the obvious: falling off something, falling on the ground, or not quite falling, but losing your balance and slipping or tripping. Generally, a fall is the result of a progression of events.

There are three laws of science involved in a slip, trip or fall: friction, momentum, and gravity. Friction is necessary to maintain a grip on the walking/working surface. Remove the friction and you will slip. When you encounter an object in your walking path and are thrown off balance, your momentum (the speed at which you are moving) will cause you to trip. Gravity is the force that pulls you to the ground. Once a slip or trip is in progress, the result is usually a fall, which is only stopped by the walking surface.

Fall characteristics

Everyone has slipped, tripped, or fallen, most times without great injury. Falls from elevations may occur infrequently, but serious or fatal injuries typically result. Slips and trips may occur with greater frequency resulting in sprains or strains or contusions.

Falls are classified into four general categories:

1. Slips, Trips, Falls on Stairs
2. Falls from Elevation
3. Slips and Trips Occur on the Same Level
4. Stair and Elevated Falls Occur from One Level to Another

Slips, Trips, Falls on Stairs

Falls on stairs occur most often when someone is traveling down the stairs without holding onto a handrail. The stair surface (design, installation, improper height, and width of riser), stair handrails (improper grip configuration), and the individual (physical condition, age, locomotion/gait characteristics, footwear) all play a role in falls involving stairs. Handrails on both sides of a stairwell assist with support if someone happens to slip, trip, or fall.

Falls from Elevation

Once a slip or trip is in progress, the degree of your loss of balance determines whether the result is a fall or remains a slip or trip. When this loss of balance is total, a fall will result. When the fall occurs on an elevated surface, the consequence of the fall increases in severity proportionately to the height of the elevation. Our first instinct is to grab on to something to prevent the fall. More often than not, that something is not available. A common misconception about the height of the working surface leads to potentially dangerous conditions. Guardrails, handrails, or handlines are often thought of as unnecessary at "minor" elevations, but if you think about it, they are generally needed. A backward fall from four feet can be fatal because the head will most likely hit the arresting surface (ground) first. Three-point contact (two hands and a foot or two feet and a hand) while on a ladder helps the employee to maintain proper support when working off ladders, including step or extension ladders.

Free-fall is the term used to describe the uncontrolled length of travel before the person either reaches an arresting surface or fall protection arresting equipment is activated. For each foot above the working surface, the severity of the injury in a free-fall increases proportionately. US OSHA measures the distance of a free-fall from foot level before the fall to foot level after the fall. The place on the person's body from where the measurement is taken really does not matter in most falls, especially in falls from great heights. For fall arresting equipment, the maximum allowable free-fall distance should be limited to the point where injury is avoided. Experts recommend that free-fall distance be limited to two feet.

Slips and Trips Occur on the Same Level

Slips and trips hazard may lead to fall injuries on the same level or on different levels. Some hazardous factors that may be common to many workplaces and contribute to a slip or trip are water on floors, grease/oil/finish on shop floors, ice and snow on parking lots, uneven walking surfaces, cluttered floors, debris, and tripping over one's own feet.

Other factors that contribute to the potential for a slip are the supporting surface (floor, walkway, working surface), the opposing surface (footwear or footgear), the individual (gait or locomotion characteristics, attentiveness, agility, disability) and the work task (lifting, reaching, moving an object).

The factors that cause a trip are the foot contacting an object or obstruction (uneven mats/rugs, cords, blocked aisles, raised edge) or too much friction between the foot and the walking surface.

Stair and Elevated Falls Occur from One Level to Another

Much like falls from an elevated surface, the consequences of a fall from one level to another increase in severity proportionately to the height of the starting elevation. Circumstances in which a person may fall from one level to another (and likely sustain an injury) include ones where the employee:

- Is on a structure that is at an elevated level
- Is using stair or steps to gain access to an elevated level
- Is at an opening through which a person could fall
- Is near an edge over which a person could fall

- Is near a surface through which a person could fall
- Is on a slippery, sloping, or unstable surface

Risk control means taking action to eliminate the safety risks so far as is reasonably practicable, and if that is not possible, minimizing the risks so far as is reasonably practicable. By eliminating a hazard, you will also eliminate any risks associated with that hazard.

Some Tips to Prevent Fall Hazards:

- Install slip–resistant flooring material such as textured, serrated, or punched surfaces and steel grating. These types of floor surfaces are good for wet, oily, or dirty operations.

- Apply anti–slip solutions that contain gritty compounds on concrete, wood, and metal floors. These products are especially useful for aisles, walkways, ramps, and loading docks.

- Provide absorbents to clean up spills where oily materials or corrosive liquids are accidentally spilled.

- Install guardrail systems, handrails, ladder cages, or barriers surrounding or nearly surrounding the climbing area of ladders.

- Provide personal fall protection (such as body harnesses) when guardrail systems cannot eliminate the risk of falling.

- Place barriers around unprotected sides and edges. Install safety net systems to catch employees who fall.

- Use hole covers to guard floor openings of at least 2 inches in size.

- Provide slip–resistant mats at entrances, around equipment, and in aisles and bathrooms where contaminants like spills, rainwater, and dirt are probable.

- Require slip–resistant footwear for employees.

Housekeeping Helps Prevents STF Accidents

Housekeeping is a broad term that refers to the routine maintenance, upkeep, and cleanliness of a workplace. US OSHA has found good workplace housekeeping reduces injuries and accidents, improves morale, reduces fire potential, and can even make operations more efficient.

To ensure that proper workplace housekeeping is maintained, a continuous process involving both workers and custodial personnel is required. Housekeeping should be incorporated into all processes, operations and tasks performed in the workplace. Efforts should be concentrated in high traffic areas, such as around stairs, platforms, and ladders; around workstations and machines; and in storage areas. Each worker needs to understand that workplace housekeeping is an integral part of his/her job and not merely a supplement to work he/she already performs. As workplace housekeeping becomes a standard part of operations, less time and effort are needed to maintain it at an appropriate level.

Use walk-through inspections to identify, evaluate and control the hazards that may be created by the lack of proper workplace housekeeping. These inspections send a message to all employees that workplace housekeeping is viewed as an important part of everyone's job. An inspection checklist is an effective tool to track performance and to communicate successes and areas requiring additional attention.

Frequently Asked Questions:

Q: Who is responsible for workplace housekeeping?

All employees share the responsibilities of keeping their workstations and work areas free from the accumulation of materials. Additional responsibilities are often assigned to custodial employees or specific departmental employees, particularly for common areas.

Q: When should workplace housekeeping efforts be performed?

Workplace housekeeping levels are most easily maintained if they are completed throughout the day as needed. At the end of the shift, all areas should be thoroughly cleaned in preparation for the next day or the following shift.

Q: What should I do as Manager or Supervisor?

Managers and supervisors must make a commitment to prevent accidental slips, trips and falls. Regular frequent inspections of working and walking areas should be conducted to identify environmental and equipment hazards which could cause slips, trips and falls. Special attention should be given to the working and walking surfaces, housekeeping, lighting, vision, stairways, and ladders. Immediate corrective action should be taken.

Appendix E

Manual Material Handling (MMH) Quarterly Focus Safety Program

[redacted]

[redacted]

Manual Material Handling Safety Control Program

September 2021

Table of Contents:

I. Overview:

Manual material handling operations are carried out daily in our plants and distribution centers. Regulations require that we protect associates from known material handling hazards e.g., lifting excessive weights, over bending at the waist, twisting without stepping, reaching/overextending, and carrying too much or many items, etc. Each handling task poses unique demands on the worker. We can help our workers perform these tasks safely and easily by implementing and upholding proper material handling policies and procedures.

II. Program Objective:

This program provides details necessary to establish control procedures related to material handling activities and maintaining safe working conditions. An organized and established plan will help prevent material handling accidents from occurring. Analyze your facility exposure to determine the need for material handling tasks and equipment taking into consideration the production requirements and efficiencies.

III. Statement of Policy:

It is important that you put your material handling safety policy and procedures in writing. The program elements must include, but are not limited to, the following:

- Define material handling procedures and proper lifting techniques to avoid injuries from excessive weights, bending, twisting, reaching, lifting, and carrying.
- Annual training of all associates is required. Once you have established the parameters of your material handling program, the policies and procedures should be communicated to all associates who may be exposed to material handling hazards.
- Any violation of this program presents a potential serious safety hazard. As such, the associates are subject to corrective action and disciplinary procedures as defined in the Corporate Disciplinary Policy for violation of safety rules related to this program.
- The type of material handling device is to be defined e.g., hand truck, cart, buggy, manual pallet jack, industrial truck, etc.
- Preventative maintenance (PM) program shall be established for all material handling equipment. Equipment will be labeled with an identification number to be tracked for service.
- Wheel cleaning schedules for material handle devices will be defined.
- Mechanical material handling device use shall be designated for authorized personnel only.
- Personal Protective Equipment (PPE) must be provided at no charge to the associate. If PPE is required, then it must be worn when handling material.

IV. Responsibilities:

The Facility Manager has the overall responsibility for ensuring the safety of the workplace by making sure appropriate safety procedures are established and enforced. He/she supports the Manual Material Handling Safety Control Program by providing adequate financial and human resources to effectively carry it out.

The Department Managers are responsible for ensuring that material handling specific procedures are developed in their areas of responsibility. They will be responsible for ensuring that procedures are followed and accidents or incidents involving material handling are thoroughly investigated. They are also responsible for reviewing each investigation report and recommendations.

The Shift Managers are responsible for ensuring that the material handling safety procedures are always followed within their area of responsibility. They also ensure that designated and specifically authorized associates, as well as all other associates, have received training in the procedures. They will investigate accidents or incidents that involve material handling to determine the root causes of the accidents or incidents and make recommendations to the Facility/Department Managers for improvements in specific procedures, equipment, and training.

The Facility Safety Coordinator is responsible for reviewing recommendations made by the Managers and Safety Committee regarding any proposed changes to the program. They are also responsible for providing technical safety assistance as requested in the development of specific procedures and investigations of accidents or incidents involving material handling. They shall periodically conduct job site audits to determine the effectiveness of the program.

V. Manual Material Handling Safety Assessment:

The extent of manual material handling risks depends on the type of materials and methods used. Therefore, we must evaluate our workplace for possible exposures and equipment used. The factors that should be considered are:

- Review Section IX. Material Handling Risk Analysis on page 5 for identified hazards, controls measure, work practices, etc.
- Assess who and what type of material handling occurs e.g., bending, reaching, lifting twisting, carrying, etc.
- Is there a probability that a material handling task could injure an associate in your process? Have you had close calls or near misses (check accident logs)?
- If material handling injuries are possible, identify the need for the task and procedure. Can the task be performed differently using a safer method?
- Identify safety devices to assist with the manual material handling task. Think about how a device could eliminate a material handling hazard.
- Inventory the manual material handling devices that are used. The availability of material handling equipment and a PM program is important. If the equipment is accessible, nearby, and working properly it will more likely be used.
- Identify devices that could assist with the lifting or moving materials e.g., a powered or adjustable lift table that raises the product and eliminates the need for an associate to bend over to lift.
- What Personal Protective Equipment (PPE) would help protect and improve the handling e.g., rubber coated safety gloves to improve the holding of the material?
- What level(s) of training should associates receive, and which associates should be trained?

Once you have identified the material handling jobs/tasks, then screen each to determine which ones are your most hazardous. Reference: Appendix F - Manual Material Handling (MMH) Screening Tool.

Then evaluate and quantify the risk related to those high hazard jobs/tasks. The objective of the assessment is to understand and improve the risk related to the material handling job/task. Reference: Appendix H - MMH Risk Assessment (FMEA) or similar risk assessment tool e.g., Liberty Mutual - R3 (Residual Risk Reduction) Assessment for Lifting/Lowering Tasks, etc.

VI. Training:

All associates must be trained during orientation concerning the Manual Material Handling Safety Control Program. Associates must be trained on the specific elements and safety procedures that will apply to them annually. See Appendix B & G.

Training should be coordinated through the facility safety coordinator and department managers. A record of training shall be documented and kept on file. See Appendix C.

VII. Periodic Inspections and Audits:

1. Periodically, and no less than annually, the Shift Manager(s) and the facility Safety Coordinator will conduct an inspection of the Material Handling Safety procedures to ensure that they are being followed. They will conduct a review with each affected associate to determine their understanding of responsibilities related to the Manual Material Handling Safety Control policies and procedures. Group meetings between the inspector and associates will be permitted.

2. The facility Safety Coordinator and Plant Manager will audit the entire Manual Material Handling Safety Control Program annually. The audit will be documented on the form shown in Appendix D. Copies of the audit report will be kept on file at the location for review.

VIII. Accident /Incident Investigations:

1. The Shift Manager and the facility Safety Coordinator will be responsible for fully investigating accidents and incidents and reporting the cause of the accidents to the Facility Manager and Safety Committee. Please refer to your plant accident/incident investigation form.

2. If an accident involved a specific material handling procedure for which there was a previously written procedure, that procedure will be used during the investigation to determine if the steps were being followed and/or if the procedure needs to be developed or modified to prevent future accidents or incidents.

3. All accident/incident details will be reviewed with all material handling personnel to educate and train them and to prevent a similar accident/incident from happening.

IX. Manual Material Handling Analysis:

Manual material handling includes materials, articles, or items that are required to be lifted, carried, or moved by a person. These materials shall be lifted, carried, or moved in such a way and with such precautions and safeguards (including protective clothing, guards, manual material handling devices, mechanical devices, or other precautions) as to ensure that lifting, carrying, or moving the material, articles, or items do not endanger anyone.

Materials shall be transported, placed, and stored so that the materials, articles, or items will not tip, collapse or fall and can be removed or withdrawn without endangering anyone. Reference Appendix F - Manual Material Handling Screening Tool to help screen your manual material handling jobs/tasks for possible hazards.

Hazards

To assess the hazards of manual material handling operations, consider the following: the load, task, environment, and operator. When these factors interact, they can create hazards that result in injuries.

A load may be hazardous due to:

- Weight, size, shape (making it awkward to handle), coupling (type of grip on the load), slippery or damaged surfaces, absent or inappropriate handles, and imbalance (e.g., changing center of gravity).

The task or method of handling may be hazardous when it involves:

- Lifting or lowering - repetitively, quickly, for extended periods of time, while seated or kneeling, an inability to get close to the load. If you are sitting, you can't lift as much weight as if you were standing.
- Moving the load long distances.
- Accuracy and precision required because of fragile loads, or specific unloading locations
- Materials positioned too low or too high
- Hazardous movements or postures (e.g., twisting, extended bending and reaching). When hips and the shoulders are out of alignment, the spine and back are twisted during lifting task; this puts the back at greater risk of an injury, since the sheer forces on the vertebrae and the discs increase significantly. Twisting also reduces the stability of the spinal column.
- Twisting while lifting, carrying, or placing the load.
- When reaching for a load. The farther away from the load, the harder it is to lift or carry. The load should be kept close to the body when lifting and carrying.
- Multiple handling requirements (e.g., lifting, carrying, unloading)
- Material handling devices such as hand truck, buggies, cart, pallet jack, etc.

Environmental factors include:

- Temperature, humidity, lighting, noise
- Time constraints (e.g., machine – paced work or deadline pressures)
- Physical conditions such as: obstacles, floor surfaces (e.g., slippery, uneven, or damaged)

Operator characteristics that affect handling loads include:

- General health
- Physical factors: height, reach, flexibility, strength, weight, aerobic capacity
- Pre-existing musculoskeletal problems
- Psychological factors: motivation, stress

Control Measures

The best control measure is to eliminate the need for workers to perform manual handling tasks. Since this is not always possible, design manual handling tasks so that they are within the workers' capabilities. Considerations to implement control measures should include the load itself, design of the workstation and work practices. Providing mechanical handling device can often eliminate the task or ease demands on the worker. By applying these control measures, you can reduce the risk of an injury. All manual material handling task should ultimately be assessed against these control measures, starting with the most hazardous material handling activities.

1. Task Design

A. The Load - Reduce the weight of the load by decreasing the:

- Size of the object (specify size to suppliers)
- Weight of container (e.g., plastic is lighter than steel)
- Target weight not to exceed 16 kg / 35 pounds
- Capacity of container & load in container

Conversely, consider increasing the weight of the load so that it may only be handled mechanically. This can be done with the use of palletized loads and larger bins or containers.

Decrease the load on the worker by:

- Limiting the number of objects, he/she is required to handle during the day
- Designating heavier loads as team lifts (i.e., two or more persons)
- Changing the size and shape of the load so that the worker can get closer to the load's center of gravity

B. Workstation Design - Reduce the distance which the load must be moved by relocating production and storage areas. Design workstations so that workers:

- Can store and handle all material between knuckle and shoulder height; waist height is most desirable
- Can begin and end handling material at the same height
- Can face the load and handle materials as close to the body as possible
- Do not have to handle loads using awkward postures or an extended reach
- Do not handle loads in confined spaces that prevent good body mechanics

Facilitate access to material by:

- Providing workbenches and other workstations with toe cut-outs, so that workers can get closer to the load
- Supplying bins and totes with removable sides
- Removing obstructions, such as unnecessary railings on bins

2. Work Practices

A. Lifting and Lowering - Eliminate the need to lift or lower manually by providing and ensuring proper use of:

- Lift trucks, cranes, hoists, scissor lifts, drum and barrel dumpers, stackers, work dispensers, elevating conveyors, articulating arms and other mechanical devices
- Gravity dumps and chutes
- Power lift tail gates on trucks, and hand trucks to ensure easy transfer of material from the truck to ground level and vice versa
- Portable ramps or conveyors to lift and lower loads onto workstations
- When lifting an object. Keep the hips and shoulders in line. When the hips and the shoulders are out of alignment, the spine and back are twisted during lifting task; this puts the back at greater risk of an injury, since the sheer forces on the vertebrae and the discs increase significantly. Twisting also reduces the stability of the spinal column. Avoid twisting while lifting, carrying, or placing the load.
- Assess task - Reference Liberty Mutual - R3 (Residual Risk Reduction) Assessment for Lifting/Lowering Tasks

B. Pushing and Pulling - Eliminate pushing or pulling by ensuring the proper use of powered conveyors, powered trucks, slides, chutes, monorails, air tables and similar mechanical devices. Make loads easier to push or pull by ensuring the proper use of carts, hand trucks, dollies with large diameter casters and good bearings, grips or handles on loads, and/ or mechanical aids placed to provide optimal push force and prevent awkward postures. When pushing or pulling, the handle of your material handling device should be between the waist and shoulder height. Instruct employees to:

- Push rather than pull
- Avoid overloading – limit the load pushed or pulled at one time
- Ensure the load does not block vision
- Never push one load and pull another at the same time
- Flag for repair carts, dollies, & buggies that are difficult to push because of thread build-up in the wheels, etc. Do not use carts that have been flagged for repair and do not use carts that are difficult to push.

C. Carrying and Holding - Reduce carrying and holding by:

- Evaluating workflow – determine if heavy loads can be moved mechanically
- Converting the operation into a pushing task
- Providing carts, buggy's, hand trucks or trolleys
- Providing portable containers to place awkward loads
- Providing grips or handles on loads
- Limiting the distance which the load is moved

D. Environmental Factors - Maintain an optimal environment by ensuring the temperature, lighting, and noise of the work area are at an acceptable level.

- In hot environments, workers shall take frequent breaks away from the heat and drink plenty of liquids
- In cold environments, workers wear good, insulated clothing. Loads are easier to handle when gloves and heavy clothing are worn
- Humidity is at an acceptable level
- Lifting instructions can be heard in a noisy environment
- Lighting levels are adequate to see in the workplace
- The layout of the work area provides good access to the load
- The aisles are clear of obstacles, and signs are posted where there is slope in the floor; whenever possible, limit such slopes to 10 degrees.

E. Storage - When storing loads, employees should use easy to access locations that are between knuckle and shoulder height. Provide proper storage facilities such as:

- Storage boxes and containers that can be lifted mechanically rather than requiring manual handling
- Avoid deep shelving that makes retrieving or placing a load difficult
- Racks or shelf trucks to store material, thus eliminating the need for lifting the containers
- Storage bins and containers with fold down sides for easier access to loads

F. Personal Factors - Appropriate clothing and safe comfortable shoes include:

- Clothes that are comfortable around the hips, knees, and shoulders
- Do not have exposed buttons or loose flaps
- Non-slip shoes with broad based low heels
- Safety footwear (steel toed shoes) is essential when handling heavy loads on a regular basis – e.g., powered equipment operator, maintenance personnel, etc. - these should be specified as part of the program.

Encourage workers to remain in good physical condition by participating in regular exercise programs.

Instruct employees to take the following precautions when handling loads:

- Test the weight of the load to ensure it can be lifted securely; if not, adjust
- Grip the load securely - Always use two hands
- Protect hands against pinch points
- Practice good team lifting
- Get help with awkward or heavy loads
- Always use the mechanical devices and aids provided
- Do not rush or cut corners

G. Maintenance - Establish a preventive maintenance program, with input from equipment manufacturers, to ensure that the following is completed regularly:

- Cleaning of wheels and bearings on hand carts, buggies, and other mechanical aids
- Lubricating as necessary
- Replacing worn and defective wheels and casters
- Checking that all mechanical devices work efficiently
- Maintain in good working condition e.g., no sharp edges, broken pieces, etc.

H. Training - Regular on the job demonstrations and practice sessions are the best methods of training. Cover basic manual materials handling procedures, and the use of mechanical aids and techniques. The objectives of material handling training are to teach the worker:

1. How to identify hazardous loads or handling tasks
2. The proper selection and use of mechanical handling aids
3. Safe postures and manual lifting techniques to minimize strain
4. Safe lifting techniques

List of Manual Material Handling Jobs/Tasks

Department	Job/Task	Procedures Yes/No	Training Yes/No	If Used MMH Device

Training Points & Sample Work Instructions

1.0 **Subject:** Material Handling Safety

2.0 **Task:** These instructions are to ensure that all associates are properly trained in material handling safety

3.0 **Application:** These work instructions pertain to anyone required to handle materials

4.0 **Tools:** Proper lifting procedures, Personal protective equipment, Material handling devices

5.0 **Reference:** Job Description – All Associates required to perform material handling

6.0 **Definitions:** Proper Lifting Techniques, Personal Protective Equipment (PPE). Material Handling Devices

7.0 **Instructions:**

A. Proper Lifting Technique

7.1 **Step 1: Consider & Plan the Lift**
Many lifting problems occur because of situations that are not considered before the load is lifted. There are many factors to consider when planning a lift. For example, where will the load be located? Where will the load be placed? Will the lifting area be constrained? Will fork trucks in the area disrupt the lifting task?

7.2 Considering the lifting conditions, path, pick-up point and set down point, can reveal problems that may interfere with a lifting task. For example, a person lifts a large, heavy box and carries it over to place it on a table. When he gets to the table, he finds that the table is not clear. He then must put the heavy box down on the floor, clear the table, and then lift the box again to the table. If the lift had been planned prior to starting, then the second low lift would not have been necessary.

7.3 **Step 2: Lift & Carry Body Position**
The feet should be placed in a stable position, about 12-18 inches apart. One foot may be behind the other, and at least one foot should be flat on the floor. If the object has handles or hand holes, use a power grip (firm hand hold) to grasp and hold it. If the object has no handles, then use a hook grip (opposite corners) or ledge support grip (side edge off surface) to grasp the object. Wear work gloves if they will help protect the hands and give better grip.

7.4 At the beginning of the lift, position the load as close to the body as possible. Keep the load close to the body throughout the lift, carry, and placement of the load. This will reduce the stress on the spine and let the strongest muscles of the arms support the weight of the object. For loads handled near the floor that are too large to fit comfortably between the legs when lifting, consider using a lifting aid or a second person to help with the lift.

7.5 Remember to lift with the legs, not with the back. This means the back should be kept vertically upright during the lift, carry and placement of the load. Keep the hips and shoulders in line. When the hips and the shoulders are out of alignment, the spine and back are twisted during lifting task; this puts the back at greater risk of an injury, since the sheer forces on the vertebrae and the discs increase significantly. Twisting also reduces the stability of the spinal column. Avoid twisting while lifting, carrying, or placing the load.

7.6 **Step 3: Maintain Stability**
Instability of the person or object during lifting activities could force a worker to use sudden jerking motions or lose control of the load. Positioning the feet at the beginning of the lift helps maintain stability. The load itself should be stable, with the weight evenly distributed. The floor surface should also be free of hazards, such as water or trash that might cause someone to slip, trip or fall while lifting. When moving material use a floor cart or buggy to move items from one point to another, when possible, instead of trying to lift & carry. When carrying a load that is unevenly weighed, keep the load as close as possible to your waist and keep the heavier side closest to your body.

B. Personal Protective Equipment

7.7 Gloves (PPE) should be worn to protect the hands from cuts and contusions. They also aid in coupling and lifting product. Test gloves before use to be sure they work as designed and are not a hindrance e.g., too slick to make a good grip, etc.

7.8 Steel Toed Shoes – should be worn by personnel where there is contact with heavy loads on a continual basis and where powered industrial vehicles are used e.g., warehouse and maintenance, etc.

C. Material Handling Equipment

7.9 Use mechanical equipment to help move materials whenever possible e.g., hand trucks, carts, buggies, etc. The use of hand trucks or carts to move materials from one area to another helps to eliminate excessive handling (see appendix G).

7.10 Raise pallets to knuckle height (approximately 30") to help prevent stooping and bending while lifting.

7.11 Scissor lifts, pallet lifts, and spring-loaded pallet lifts and buggies can be effective at raising the work to prevent bending and stooping. Make sure you follow all safety procedures prescribed for this equipment.

7.12 Use a case hook to help reach materials that are stored deep in a pallet or rack.

7.13 Use powered equipment (authorized personnel only) to move heavy material instead of human strength. Use of any powered equipment is restricted to authorized personnel only.

7.14 When pushing carts & buggies, the larger the wheel, the easier the cart will be to push. Swivel casters also improve control when pushing.

7.15 If floor conditions (uneven or broken surfaces) impair the use of material handling equipment i.e., carts, buggies, hand trucks, etc. report to your immediate supervisor for repair.

7.16 If cart or buggy wheels are clogged with thread and hard to move, flag cart for wheel cleaning. Do not use cart or buggy until wheels are cleaned.

7.17 Report any material handling equipment damage or malfunction immediately to your supervisor. Flag the equipment for repair. Do not use damaged or malfunctioning equipment.

D. General Precautions

7.18 Store the heaviest items on shelves between knuckle and shoulder height to reduce bending and reaching while lifting.

7.19 Raise and tilt large containers to reduce bending while lifting.

7.20 Remove the sides from returnable containers (such as bulk paks, uni-paks, etc.) when the material inside is low, to prevent bending and reaching over the sides.

7.21 Vertical handles on carts make it accessible to different size people.

7.22 Use handles on carts. This will make the cart easier to hold and improve posture when pushing, as well as protect the hands from contact hazards.

7.23 Always push rather than pulling loads.

7.24 Do not try to catch a falling box. If the item starts to tip-over or fall-off of a stack or shelf, do not try to stop it. Let it fall.

7.25 Always get assistance to handle awkward or heavy loads.

7.26 If cart or buggy wheels are clogged with thread and hard to move, flag cart for wheel cleaning repair. Do not use cart or buggy until wheels are cleaned.

7.27 Never climb into or on racks or storage shelves.

7.28 Always keep your sight in the direction of travel clear. Do not stack material too high that it blocks your view.

7.29 Only handle one cart or buggy at a time. Do not push and pull together.

7.30 Don't rush or cut corners to get the job done.

7.31 Always use two hands to handle packages and materials.

E. Safety Responsibility

7.32 All associates are responsible for following our material handling procedures, using proper lifting techniques, wearing appropriate PPE, and the use of material handling equipment when authorized.

7.33 Associates shall sign off on these guidelines to show that they understand material handling procedures and know their material handling responsibilities.

Associate: _____

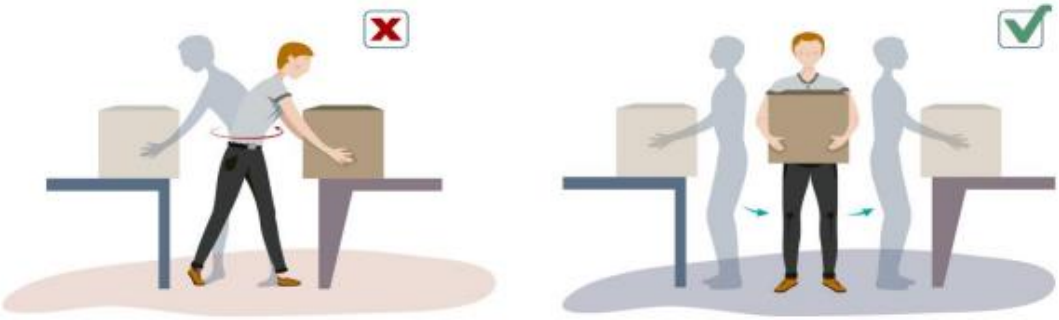
Resource Manager: _____ **Authorized Associate:** _____

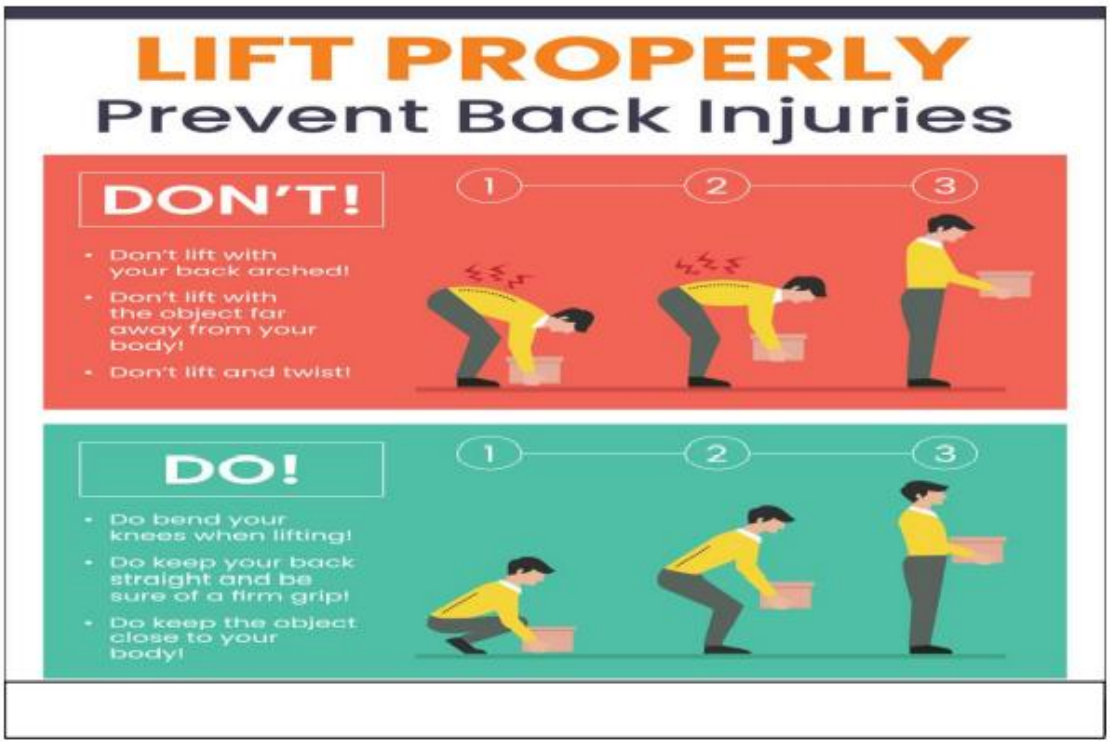
Date: _____ **Unauthorized Associate:** _____

Circle: All that applies to authorization:

A. Lifting, B. PPE, C. Material Handling Equipment, D. General Precautions, E. Safety Responsibility

Don't Twist – Step to Place Object





Training Record/Certification for Manual Material Handling Equipment & Program

This is to certify that the undersigned completed training in accordance with the provisions of Manual Material Handling Safety Control Program. The following individuals received training.

(Print) Associate Name	Signature	Department	Authorized to Use MHE - Yes/No	Type of Equipment

Print Instructor's Name: _____ Job Title: _____

Instructor's Signature: _____ Date of Training: _____

Manual Material Handling Safety Control Program Audit Report

Date of evaluation: _____
Evaluation made by: _____ Job Title: _____

1. General MMH policy has been reviewed? YES/NO
   Comments on the general policy: _____

2. Inspected and reviewed the material handling safety procedures with associates: YES/NO
   Comments on periodic inspections, deficiencies, and corrective actions: _____

3. The following equipment specific procedures were reviewed (list procedure numbers):

4. Is the wheel cleaning and PM program for MHE being maintained? YES/NO
   List departments reviewed:

5. A review of the OSHA 300 log or equivalent accident recordkeeping forms was completed to identify material handling related accidents. YES/NO

The following material handling accidents were reported (list date, accident report number, and employee name):

If accidents have occurred, were formal accident investigations completed for each accident? YES/NO

Were equipment or specific procedures reviewed and modified as needed because of the accident investigations? YES/NO

Do you consider those modifications to have been effective in preventing similar types of accidents? YES/NO

Comment on any NO responses for the last 3 questions: _____

Additional comments and recommendations for the Manual Material Handling Safety Control Program:

Signature/Title: _____ Review Date: _____

Manual Material Handling Equipment Survey

Date: _____

Department	Type of Device	Identification #	Job/Task

Manual Material Handling (MMH) Screening Tool

This list is designed as a tool to quickly identify potential problems with a task/job. Additional risk factors may exist that are not accounted for in this list. It is common practice to follow up on list observations with more precise techniques to confirm problem risk factors. A **"No"** response indicate potential problem area that should be investigated further.

1. Are the weights of loads to be lifted judged acceptable by the workforce?	Yes	No
2. Are materials moved over minimum distances?	Yes	No
3. Is the distance between the object load and the body minimized?	Yes	No
4. Are walking surfaces level?	Yes	No
• Wide enough?	Yes	No
• Clean and dry?	Yes	No
5. Are objects easy to grasp?	Yes	No
• Stable?	Yes	No
• Able to be held without slipping?	Yes	No
6. Are there handholds on these objects?	Yes	No
7. Do the use of gloves help the task?	Yes	No
8. Is the proper footwear worn?	Yes	No
9. Is there enough room to maneuver?	Yes	No
10. Are mechanical aids used whenever possible?	Yes	No
11. Are working surfaces adjustable to the best (neutral) handling heights?	Yes	No
12. Does material handling avoid:		
• Movements below knuckle height and above shoulder height?	Yes	No
• Static (constant) muscle loading?	Yes	No
• Sudden movements during handling?	Yes	No
• Twisting at the waist?	Yes	No
• Extended reaching?	Yes	No
13. Is help available for heavy or awkward lifts?	Yes	No
14. Are high rates of repetition avoided by job rotation?	Yes	No
• Self-pacing?	Yes	No
• Sufficient pauses?	Yes	No
15. Are pushing or pulling forces reduced or eliminated?	Yes	No
16. Does the employee have an unobstructed view while handling the load?	Yes	No

Manual Pallet Jack & Hand Truck Safety

1. Manual Pallet Jack Safety

Safety Procedures

- ☐ Please read and understand the operation and safety concerns before operating manual pallet truck.
- ☐ Never exceed the rated capacity of the hand pallet truck and always distribute the loads evenly over the width and length of the forks.
- ☐ Never pick up a load with only one fork or try to position the load with only the fork tips.
- ☐ Never put your hands or feet under or between the pallet truck frame assemblies. Always wear safety shoes when operating this equipment.
- ☐ Do not allow pallet truck to "shock load" by dropping from one level to another.
- ☐ Make sure length of pallet truck forks match the length of the pallet. It is critical that the rollers extend beyond the openings after the pallet bottom boards.
- ☐ Hand pallet trucks are intended to be operated on hard and flat surfaces. If ramps are encountered, it is recommended that a hand pallet truck with optional manual brake be used.
- ☐ Hand pallet trucks are not to be used by an operator that is not physically capable of safely maneuvering the hand pallet truck with the load.
- ☐ Like any other mechanical equipment, hand pallet trucks should be lubricated and inspected periodically (at least every six months) for loose or missing components. Report an unsafe pallet truck to your supervisor and tagged/marked it "DO NOT operate unsafe equipment".

Pallet Jack Safety Concerns

- Load dropped on foot.
- Strain or dislocation of shoulder due to forceful pulling of a pallet jack.
- Strains from moving a loaded pallet jack.
- Trips from exposed pallet jack "forks."
- Slip and fall from wet floors while pushing a pallet jack.

Pallet Jack Training

- Know the load capacity.
- Know the following handle positions: Raise position, Neutral position, Lower position
- Be familiar with ramps, narrow aisles or floor obstructions that could cause an incident.
- Clean up wet floors – could cause a slip and fall while pushing a pallet jack.

Handling Wooden Pallets

- Wooden pallets can weigh 30-40 lbs.
- Always wear gloves when handling pallets.
- Never stand on pallets or use as a work platform.
- Never stand a pallet on end.
- When a pallet is emptied, remove it immediately.
- An empty or unloaded pallet is a trip hazard.
- Do not stage pallets at the end of aisles or around corners – avoid creating a trip hazard.
- Store stacks or excess pallets outside – they are a fire hazard.
- Tarp or protect pallets stored outdoors from water, as water-soaked pallets can weigh 50 or more pounds.

Manual Pallet Jack Best Practices

- Report damaged or worn pallet jacks.
- Report pallet jacks that have flat spots in wheels or that will not roll well.
- Report pallet jacks with a failing hydraulic unit.
- Never overload the pallet jack load capacity.
- Only PUSH pallet jacks.
- NEVER PULL - pallet jacks place major strain on shoulders could result rotator cuff injury!
- Start the pallet jacks slowly – no shoving.
- Never yank or throw the pallet jack handle.
- Never stand on a pallet jack.
- Never ride a pallet jack.
- Unused pallet jacks are a major trip hazard. When not in use, pallet jacks must be rolled into an area that does not have pedestrian traffic: Under a shelf or pallet rack, in a pallet, or under a table.
- Keep your heels safe! Move the jack slowly to prevent it from running up on your heels.
- Do not brace or stop a pallet jack with your foot!
- When moving a pallet jack & load, keep the jack control handle in the "neutral" position.
- Never place your feet under the forks or load.
- Lower load before working around a pallet jack.
- Never leave a pallet jack with the load elevated.
- Keep the pallet jack in front of you when descending a ramp.
- Wear gloves when handling pallets.
- When a pallet jack is stuck in a pallet, push down on the handle until the front fork wheels come up slightly, and then slowly pull the jack out of the pallet.
- Stack the pallet load so it will not shift or turn over – the handle can create a struck by hazard if the pallet jack turns over.
- Approach intersections with caution. Keep vision clear of area and watch for other material handling traffic and pedestrians.

All pallet jacks should have a safety instructional label. This is an example of a Manual Pallet Jack /Truck Safety Instructional Label.

For safe operation of a hand pallet jack, please read the following instructions:

Do Not *operate hand pallet truck until you have checked its condition. Give special attention to the wheels, handle, forks, lift and lowering control and brake (if so equipped).*

Do Not *operate damaged or faulty trucks.*

Do Not *attempt repairs unless you are trained and authorized to do so. Never place any part of your body in the lifting mechanism or under the forks or load.*

Do Not *carry passengers.*

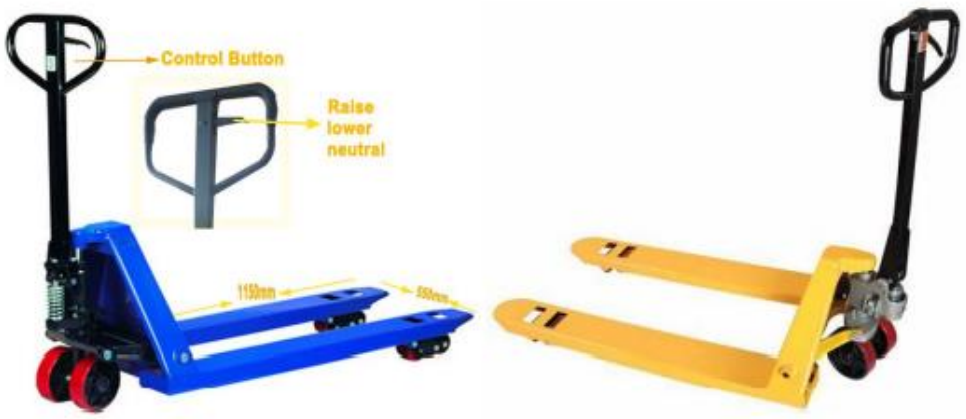
Do Not *handle unstable or loosely stacked loads. Use special care when handling long, high, or wide loads.*

Do Not *overload the truck – check capacity rating. Over loading may cause the truck to perform incorrectly.*

The capacity rating of the truck assumes an evenly distributed load with the center of the load being halfway point off the fork length.

Operate Hand Pallet Trucks only from the designated operating position. Make sure that fork lengths match the length of the pallet. Lower the forks to lowest height when the truck is not being used.

Hand Pallet Trucks are for general operation on level, flat, hard surfaces. It is important not to operate a hand pallet truck on a grade with loads that are too heavy to be easily handled by the operator. Since these are manually operated trucks, they are not to be used by operators that are not physically capable of safely handling the truck with load.



2. Manual Hand Truck Safety

Hand Trucks can be beneficial in many different work environments. They are used to move items that are too heavy or too numerous to be lifted safely using just your arms and legs. Hand trucks come in different sizes that hold various weights.

It takes some thought to choose the correct hand truck for the job. Make sure you choose the right size and design to handle the load. Curved bed trucks, for example, are designed to handle drums. With that in mind, think about loading and operating the hand truck safely. Two-wheeled hand trucks look easy to handle, but it is easy to lose the load if you do not keep safety in mind.

Four-wheeled hand trucks are like the two-wheeled versions. However, pay extra attention to loading procedures. Four-wheeled trucks can be easily tipped, so make sure that your load is balanced and secure. They should generally be pushed instead of pulled, except for those trucks equipped with a fifth wheel and pulling handle.

Also be sure that you can see over the load. If this is impossible and you cannot reduce the size of the load, get someone to serve as a guide. Also take extra care to place your hands properly so they will not get squeezed or crushed by the load.

Hand Truck Procedures Best Practices

1. Hand Trucks Can Reduce Manual Lifting and Strain - They are often a good choice for:
    - Heavy or awkward loads
    - Reducing the number of trips needed to transport materials

2. Choose the Right Truck for the Job - Be sure it can handle the load's weight and size.
    - Use specialty trucks only for their specific purpose (e.g., curved bed trucks for drums or other round containers).

3. Plan and Prepare for the Job
    - Check your route and remove any obstructions.
    - Wear sturdy shoes with nonskid soles.
    - Wear gloves that give you a good grip.
    - Avoid loose or baggy clothing that could trip you or get caught in truck wheels.

4. Use Proper Lifting Techniques - Loading & Unloading Hand Truck
    - Bend your knees and keep your back straight, so your legs, not your back, do the work.
    - Do not overexert yourself.
    - Do not try to lift more than you can manage safely.
    - Slide items onto shelves. Place items securely so they will not fall.
    - Park hand trucks so they do not become a tripping hazard in the aisles e.g., under shelving, towards the wall, etc.

5. Load Trucks for Good Balance and Stability
    - Place heavy objects at the bottom.
    - Position the load forward over the axles so the truck, not the handles, carries the weight.
    - Stack objects only to a height that you can see over while walking.
    - Make sure the load is stable and will not shift or fall.
    - Tie or secure any bulky, awkward, or delicate objects.

6. Operate Trucks to Minimize Physical Strain and Maximize Control
   - Grip the handle firmly.
   - Bend your knees and keep your back straight.
   - Lean in the direction you are going.
   - Walk, do not run. Move slowly and cautiously.
   - Push the truck, do not pull. You will not have to work as hard.
   - Walk backwards only if necessary to maneuver into a tight place.
   - Do not brace or brake the truck with your foot.
   - Keep the truck ahead of you going downhill, behind you going uphill. You will maintain better control and the wheels will not run over your feet.

7. Keep Your Eyes on the 'Road' and Stay Alert
   - Look for and remove any items that could trip you or block the truck.
   - Be on the lookout for other vehicles and pedestrians, especially at intersections.
   - Keep yourself and the truck wheels away from dock and platform edges.

8. Inspect hand truck daily before use.
   - Check tires for proper air pressure or if hard tires, check for "chipped tires."
   - Check frame for broken or bent areas.
   - Check the load capacity – do not overload trucks.
   - Test brakes – if applicable – before using trucks.
   - Inspect for obstacles, slippery spots, inclines, blind corners, etc. before moving the load.
   - Check lubrication – Keep records of lubrication dates.

For Jobs/Tasks assessed needing more review using the Appendix F - MMH screening tool. Conduct a Risk Assessment using the Failure Mode & Effects Analysis (FMEA), Liberty Mutual - R3 (Residual Risk Reduction) Assessment for Lifting/Lowering Tasks, or similar risk assessment tool. The objective of the assessment is to quantify, understand and improve the risk related to the material handling job/task.

Failure Mode and Effects Analysis (FMEA)													
Potential Accident	Potential Injuries	Severity (1-10) 10 - most severe	Potential Causes	Likely to Occur (1-10) 10 - most likely	Current Controls	Detection (1-10) 10 - least detectable	Current RPN	Potential Action	Severity (1-10)	Likely to Occur (1-10)	Detection (1-10)	Ideal Target <100 Potential RPN	Change in RPN
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0
							0					0	0

Welcome to the FMEA Safety Worksheet

Failure Mode and Effects Analysis (FMEA)

This spreadsheet can be used to

1. Identify potential failure modes and their impact on Safety reliability.
2. Rank the potential defects to establish priority - The highest RPN value items deserve the most attention.
3. Capture owners, action plans, and status on high RPN items.
   Note, FMEA's are living documents and this may be updated periodically.

Risk Priority Number (RPN) - Is a measure used when assessing risk to help identify critical failure modes associated with your design or process.
The RPN values range from 1 (absolute best) to 1000 (absolute worst).

Severity (S)
Severity (S) X Occurrence (O) - Criticality
Severity (S) X Occurrence (O) X Detection (D) = Risk Priority Number (RPN)

Severity (S) - Severity is a numerical subjective estimate of how severe the user will perceive the EFFECT of a failure.

Occurrence (O) - Occurrence or sometimes termed LIKELIHOOD, is a numerical subjective estimate of the LIKELIHOOD that the cause of a failure.

Detection (D) - Detection is sometimes termed EFFECTIVENESS. It is a numerical subjective estimate of the effectiveness of the controls to prevent or detect the cause or failure mode before the failure causes an injury.

General Checklist to Comply with Manual Material Handling Safety Control Program

1. Do you have an assigned Manual Material Handling Team for the facility?	Yes	No
2. Have you developed a Manual Material Handling Safety Control Policy & Procedures? See Appendix B.	Yes	No
3. Have you identified all manual material handling devices? Appendix E – Material Handling Equipment Survey	Yes	No
4. Have you screened all manual material handling jobs/tasks for potential problems? See Appendix F – MMH Screening Tool	Yes	No
5. Have you conducted a Safety Risk Assessment for each identified job? See Appendix H - FMEA.	Yes	No
6. Are all authorized employees indicated in writing (those required to handle materials and use devices)? The fewer associates exposed, the better, and thus, fewer accidents. See Appendix C.	Yes	No
7. Do you have a Preventative Maintenance (PM) and wheel cleaning program (Including designated workstation, tools, schedule, etc.) for all material handling equipment? See Appendix E.	Yes	No
8. Have you trained and authorized employees in Manual Material Handling Safety Procedures, and documented the training? See Appendix C.	Yes	No
9. Have you selected and purchased appropriate safety devices, personal protective equipment, tools, etc.?	Yes	No
10. Is training completed and documented when changes are made in Manual Material Handling: PPE, Equipment, or Procedures?	Yes	No
11. Are all associates (other than authorized associates in the facility) educated/trained about Manual Material Handling Safety Control Program?	Yes	No
12. Are you completing the annual Manual Material Handling Safety Control Program audit report? (The review of program, procedures, devices, and accidents.) See Appendix D.	Yes	No

Appendix F

Hotel Employees' Perceived Job Risk Scale (HEPJR)

Perceived Personnel Risk	PPR_01. Excessive workload may hurt my body. PPR_02: Physical injury may occur if I disobey the rules. PPR_03: Long-term hotel work may cause severe back pain. PPR_04: My colleagues' improper behaviour may hurt me. PPR_05: Customer' improper behaviour may hurt me.
Perceived Equipment Risk	PER_01. Improper design of hotel equipment may cause accidental injuries. PER_02. Difficult usage of hotel equipment may cause accidental injuries. PFR_03: Ageing hotel facilities may cause accidental injuries. PFR_04: Failure of hotel facilities may cause accidental injuries. PFR_05: The lack of professional safety equipment may cause accidental injuries.
Perceived External Environment Risk	PEER_01: The people around the hotel are not very friendly to me. PEER_02: Public safety around the hotel is not good. PEER_03: The sanitation environment around the hotel is not clean. PEER_04: There are natural disaster risks around the hotel.
Perceived Internal Environment Risk	PIER_01: The air quality is not good in the hotel. PIER_02: The working conditions are not good in the hotel. PIER_03: There are many hidden risks in the hotel. PIER_04: The working atmosphere is very depressed in the hotel. PIER_05. My supervisor and colleagues put me on the spot at work. PIER_06. I feel a lot of performance pressure when working at this hotel.
Perceived Management Risk	PMR_01: The hotel does not attach importance to emergency drills. PMR_02: The hotel lacks practical contingency plans. PMR_03: The hotel rarely warns about job risks. PMR_04: I am worried about the hotel's emergency response capabilities. PMR_05: I am worried about the hotel's ability to prevent work-related injuries.

Appendix G

Manufacturing Perceived Job Risk Survey (MPJR)

Working too much can hurt an associate's body.
Associates can get hurt if they don't follow safety protocols.
Other people can get hurt if I don't follow safety protocols.
Long-term work can cause permanent damage to my body.
Associates can get hurt if their coworkers don't follow safety protocols.
Poor equipment design can cause accidental injuries.
Equipment that is difficult to use can cause accidental injuries.
Out-of-date equipment can cause accidental injuries.
Failure to maintain plant housekeeping can cause accidental injuries.
The plant's lack of safety equipment can cause accidental injuries.
People can get hurt if they do not use the correct safety equipment.
People do not have the safety equipment they need.
The people around the plant are not very friendly to me.
The plant is not a safe place to work.
The environment in and around the plant is not clean.
The plant is unprepared for natural disaster risks.
The air quality in the plant is not good.
The working conditions in the plant are not good.
There are many hidden risks in the plant.
The working atmosphere in the plant is very depressed.
Supervisors and coworkers put associates on the spot at work.
Associates feel a lot of performance pressure when working at this plant.
The plant does not emphasize the importance of emergency drills.
The plant does not have practical contingency plans.
The plant rarely warns about job risks.
I am worried about the plant's emergency response capabilities.
I am worried about the plant's ability to prevent work-related injuries.
I am worried about the plant's ability to respond to work-related injuries.

Appendix H

Broadly Applicable Measure of Risk Perception

Extreme Weather Events	EW1: I am interested in receiving more information about weather hazard X in my local community. EW2: I intend to search for information about preparing for weather hazard X and safety protocols in the future. EW3: In the future, I intend to prepare my home for weather hazard X. EW4: I intend to obey future warnings to seek shelter or evacuate during weather hazard X. EW5: I intend to develop and maintain a plan for how I will respond to weather hazard X in the future.
Contaminated Waterways	CW1: I am interested in receiving more information about contaminated waterways in my local community. CW2: I intend to search for more information about safety protocols in the event that local waterways are potentially contaminated. CW3: I intend to search for information about my impact on local waterways. CW4: I intend to use filtered or bottled water to avoid drinking polluted water in the future. CW5: I intend to change my behaviors to reduce my future impact on local waterways. CW6: I intend to donate to a local organization involved in cleaning up polluted waterways. CW7: I intend to volunteer for a local organization involved in cleaning up polluted waterways.
Walking in a Dangerous Neighborhood	DN1: I am interested in receiving information about how to stay safe when walking late at night in a dangerous neighborhood. DN2: I intend to plan a route to get where I'm going so I don't have to walk late at night in a dangerous neighborhood. DN3: If I would have to walk late at night in a dangerous neighborhood in order to get where I wanted to go, I intend to get a ride or take a cab instead. DN4: If I could not get a ride and would have to walk late at night in a dangerous neighborhood in order to get where I wanted to go, I would cancel my trip.
Eating Potentially Contaminated Food	CF1: I am interested in receiving information about the possible contamination of food wherever I travel. CF2: I plan on taking medicine with me wherever I travel in the event that I get sick from eating potentially contaminated food. CF3: I intend to plan my trips so that I never have to eat potentially contaminated food. CF4: If I had to choose between eating potentially contaminated food and not eating at all, I would not eat.

Appendix I

Topical Risk Perception Survey (TRP)

How concerned are you (if at all) about an injury occurring in your plant related to slips, trips, or falls?
If an associate did experience a slip, trip, or fall, it is likely that it would negatively impact them.
I intend to search for information about preparing for slips, trips, or falls incidents and safety protocols in the future.
I intend to develop and maintain a plan for how I will respond to slips, trips, or falls incidents in the future.
How concerned are you (if at all) about an injury occurring in your plant related to manual material handling?
If an associate did experience an injury related to manual material handling, it is likely that it would negatively impact them.
I intend to search for information about preparing for manual material handling incidents and safety protocols in the future.
I intend to develop and maintain a plan for how I will respond to manual material handling incidents in the future.
How concerned are you (if at all) about an injury occurring in your plant related to caught in/pinch points/entrapment?
If an associate did experience a caught in/pinch points/entrapment, it is likely that it would negatively impact them.
I intend to search for information about preparing for caught in/pinch points/entrapment incidents and safety protocols in the future.
I intend to develop and maintain a plan for how I will respond to caught in/pinch points/entrapment incidents in the future.
How concerned are you (if at all) about an injury occurring in your plant related to powered industrial trucks/pedestrian segregation?
If an associate did experience a powered industrial trucks/pedestrian segregation incident, it is likely that it would negatively impact them.
I intend to search for information about preparing for powered industrial trucks/pedestrian segregation incidents and safety protocols in the future.
I intend to develop and maintain a plan for how I will respond to powered industrial trucks/pedestrian segregation incidents in the future.

Appendix J

Focus Change Audit (FCA)

1. Have you communicated the importance of being aware of slip, trip, and fall hazards to associates?

☐ Yes

☐ No

1a. **If you answered yes to number 1:** How have you communicated the importance of being aware of slip, trip, and fall hazards to associates? (**Please select all that apply**)

☐ Gave a one-time safety talk or demonstration on slip, trip, and fall awareness

☐ Incorporated discussion of them in daily or weekly meetings

☐ Posted signage around the facility

☐ Tied reporting slip, trip, and fall hazards to a reward or rewards

☐ Other (describe): _____

2. Please select all that apply: In the past seven months, have you put in place a policy, changed a practice to prevent future hazards, initiated training, or used a new information sharing practice related to slips, trips, and falls? (**Please select all that apply, and fill out the sub-questions associated with each**)

☐ Policy

☐ What is the name of this policy?

_____

☐ Describe the policy

_____

_____

_____

_____

☐ During what quarter did you implement this policy? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ Changed a practice

☐ What practice did you change?

_____

☐ Describe the change you made

_____

_____

_____

_____

☐ During what quarter did you make this change? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ Training

☐ What kind of training did you do?

_____

☐ Describe the training you did

_____

_____

_____

_____

☐ During what quarter did you implement this training? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ Information sharing

☐ What kind of information sharing program did you start?

_____

_____

_____

☐ Describe the information sharing program you used

_____

_____

_____

_____

☐ During what quarter did you implement this information sharing program? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ None of the above

☐ Other (please describe):

_____

3. Have you communicated the importance of being aware of manual material handling hazards to associates?

☐ Yes

☐ No

3a. **If you answered yes to number 3:** How have you communicated the importance of being aware of manual material handling hazards to associates? (**Please select all that apply**)

☐ Gave a one-time safety talk or demonstration on manual material handling awareness

☐ Incorporated discussion of them in daily or weekly meetings

☐ Posted signage around the facility

☐ Tied reporting manual material handling hazards to a reward or rewards

☐ Other (describe):

_____

4. Please select all that apply: In the past six months, have you put in place a policy, changed a practice to mitigate future hazards, initiated training, or used a new information sharing practice related to manual material handling? (**Please select all that apply, and fill out the sub-questions associated with each**)

☐ Policy

☐ What is the name of this policy?

_____

☐ Describe the policy

_____

_____

_____

_____

☐ During what quarter did you implement this policy? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ Changed a practice

☐ What practice did you change?

_____

☐ Describe the change you made_____

_____

_____

_____

☐ During what quarter did you make this change? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ Training

☐ What kind of training did you do?

_____

☐ Describe the training you did

_____

_____

_____

_____

☐ During what quarter did you implement this training? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ Information sharing

☐ What kind of information sharing program did you start?

_____

_____

_____

☐ Describe the information sharing program you used
_____
_____
_____
_____

☐ During what quarter did you implement this information sharing program? (**Please circle only one**)

Q1 of 2021 Q2 of 2021 Q3 of 2021 Q4 of 2021 Q1 of 2022

☐ None of the above

☐ Other (please describe):
_____

Appendix K

MPJR Item Reliability Statistics

			if item dropped	
	mean	item-rest correlation	Cronbach's α	McDonald's ω
Q1	5.56	0.24831	0.829	0.827
Q2	6.64	0.01647	0.834	0.831
Q3	6.50	-0.01945	0.835	0.832
Q4	5.10	0.37236	0.825	0.823
Q5	6.54	-0.04613	0.835	0.832
Q6	6.46	0.13764	0.831	0.828
Q7	6.00	0.23886	0.829	0.826
Q8	5.64	0.22611	0.830	0.826
Q9	6.42	0.00367	0.834	0.831
Q10	6.16	0.17517	0.831	0.828
Q11	6.57	0.10524	0.832	0.828
Q12	3.20	0.39171	0.824	0.824
Q13	2.32	0.33917	0.826	0.825
Q14	2.17	0.49388	0.821	0.819
Q15	2.86	0.43523	0.822	0.821
Q16	2.55	0.38798	0.824	0.823
Q17	2.85	0.52181	0.818	0.817
Q18	2.46	0.54780	0.818	0.817
Q19	3.93	0.44980	0.821	0.822
Q20	2.78	0.46841	0.821	0.820
Q21	3.62	0.47139	0.820	0.821
Q22	3.92	0.52247	0.818	0.819
Q23	2.31	0.32774	0.826	0.825
Q24	2.47	0.34067	0.826	0.825
Q25	3.12	0.40491	0.823	0.824
Q26	3.05	0.53765	0.817	0.819
Q27	2.94	0.57064	0.816	0.818
Q28	2.99	0.54602	0.817	0.819

Appendix L

TRP Reliability Statistics

			if item dropped	
	mean	**item-rest correlation**	**Cronbach's α**	**McDonald's ω**
Q29	4.71	0.435	0.909	0.919
Q30	4.60	0.427	0.909	0.918
Q31	5.04	0.602	0.903	0.911
Q32	5.27	0.576	0.904	0.912
Q33	4.60	0.566	0.904	0.916
Q34	4.65	0.617	0.902	0.914
Q35	4.99	0.717	0.899	0.907
Q36	5.22	0.679	0.901	0.908
Q37	5.09	0.568	0.904	0.915
Q38	4.82	0.485	0.907	0.917
Q39	5.12	0.721	0.899	0.907
Q40	5.29	0.698	0.900	0.908
Q41	4.59	0.569	0.904	0.915
Q42	4.98	0.522	0.906	0.916
Q43	5.04	0.731	0.899	0.907
Q44	5.12	0.682	0.901	0.908

Vita

Catherine Elizabeth Parks was born in Wilmington, North Carolina to Rip and Debbie Parks. She graduated from Isaac Bear Early College High School in May 2015. The following autumn, she entered the University of North Carolina at Wilmington to study Creative Writing and Psychology, and in May of 2019 she was awarded a Bachelor of Arts degree and a Bachelor of Fine Arts degree with a certificate in Publishing. In the Fall of 2020, she accepted a research assistantship in Industrial/Organizational Psychology and Human Resource Management at Appalachian State University and began study toward a Master of Arts degree. The M.A. was awarded in August 2022. Subsequently in August 2022, she began work as a Research Coordinator with intent to pursue a Ph.D. in Industrial/Organizational Psychology.