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Injury Risk at Work, Safety Motivation, and the Role of Masculinity: A Moderated Mediation

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Injury Risk at Work, Safety Motivation, and the Role of Masculinity: A Moderated Mediation

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For safety researchers, 2010 was a reminder of the work that has yet to be done. The Deepwater Horizon drilling rig explosion of late April was the most devastating oil spill in recorded history, and the Upper Big Branch Mine disaster resulted in the highest death toll of US miners in 40 years from a single incident (Urbina, 2010). Relevant to the present research is that 100% of the victims who died in both disasters – 11 from the oil rig explosion, 29 from the underground mine explosion – were male workers (Simpson, 2010; Urbina, 2010). Given this observation, a pressing question emerges: W*hy do men as whole face unique, and perhaps even greater, safety and health risks across occupations?* To a certain extent, the answer to this question calls for a bridge between safety research and the men and masculinity literature in which theories about masculinity can be used to help explain sex-based findings in occupational health and safety research. More specifically, I argue that a gendered psychological perspective is crucial to understanding the individual and occupational risk factors that contribute to men's risk for workplace injuries and accidents, whereby the occupational risk inherent in hazardous jobs, workers' perceived susceptibility to this risk, and the resulting safety-related attitudes and values in response to job risk are all at least partly influenced by masculine roles and norms at play in the workplace.

To begin, I will provide a brief overview of safety motivation and the rationale underlying how both occupational and perceived risk predicts such motivation, as grounded within an existing framework of workplace safety literature. The primary contribution of the present research follows – an articulation of how a gendered explanation of the occupational injury and accident rate for men is necessary and theoretically relevant.

Safety Motivation as a Central Construct in the Examination of Workplace Injuries

Most workplace safety models incorporate some risk factor components to predict unsafe behavior or injuries (e.g., Hofmann & Stetzer, 1996; Lund & Aarǿ, 2004; Zohar, 1980). However, the safety model developed by Neal and Griffin (2004) differs in that these risk factors affect a chain of safety-related attitudes and behaviors such that risk factors first affect safety motivation and knowledge, which then affect safety performance, which ultimately impact safety outcomes (accidents/injuries). In this way, the impact of individual or contextual determinants of safety performance is mediated through increases in safety knowledge or motivation (Christian, Bradley, Wallace & Burke, 2009).

What exactly is safety motivation? Safety motivation is often viewed from an expectancy-value perspective in the sense that motivation to perform one's job safely is contingent on the attitudes and values placed on safety (Ford & Tetrick, 2008). One theoretical model including safety motivation is the protection motivation theory (Rogers, 1975) which describes safety motivation as a direct function of workers' motivation to protect themselves. This self-protection motivation involves perceiving susceptibility to the injury, perceiving severity of consequences to the injury, perceiving the effectiveness of an offered health action to deter risks for the injury, perceiving barriers or obstacles to taking said action, and self-efficacy expectancy of the worker's capability to execute the action successfully. Simply put, intentional safety behaviors are based on the expected outcomes of safety-related behavior and the value placed on those outcomes (Ford & Tetrick, 2008). Hence, safety motivation is conceptualized as goal-driven (i.e., toward an expected outcome) and it is this process of implicit goal setting and achievement that drives safety motivation as a salient predictor of safety-related behavior. This means that safety motivation is determined by the degree to which the organization and the individual place a high value on achieving safe practices at work, and this value is itself determined by job risk (i.e., threats to safety) and the degree to which these risks are perceived and acted upon. In other words, safety motivation is best understood as the values, attitudes, and goals that workers use to comprise their own motivation for safety-related practices and behavior. From an expectancy-value perspective, motivation is created out of a sense of need. Because of this, safety motivation must at least in part be based on the perception that safety behavior is needed given the safety-related risks present in any given work context and the individual interpretation of the saliency of these risks.

Predictors of Safety Motivation: Occupational and Perceived Risk

Of particular interest to the present research is the set of relationships among the physical dimension of risk associated with an occupation (i.e., *occupational risk*), the perceived dimension of risk observed by the individual worker (i.e., *perceived risk*), and safety motivation. As depicted in Figure 1, the present research focuses on how occupational risk influences perceived risk, which subsequently affects safety motivation (the role of gender follows shortly).

Of course, some industries and occupational titles carry more risk than others. A masonry worker who uses brick, stone or granite to build various structures has a higher degree of injury and accident risk than a corporate executive or accountant. In other words, job risk fundamentally varies with respect to job type. Hazards and risks fluctuate by occupation, and as such the emphasis placed on maintaining safe practices fluccuate with respect to occupational hazards and risks. Because the value placed on safe outcomes depends on how much risk is involved in the work context (Ford & Tetrick, 2008), safety motivation should vary by the level of occupational risk, or the hazard exposure in the working environment.

H1: Occupational job risk will positively predict safety motivation.

Additionally, the hazards and risks present in a work context should influence whether workers perceive their jobs as hazardous or high-risk. Although perceived job risk could have underlying personality influences (such as cautiousness or neuroticism), the degree to which one perceives risk in the workplace is at least partially based on the risks inherent in the workplace itself (Wildavsky & Dake, 1990). In other words, a workplace must have some risks or hazards in order to be perceived as risky. Because of this, for example, we would reasonably expect mining machine operators to evaluate the level of risk in their occupation higher than a web administrator might.

H2: Occupational job risk will positively predict perceived job risk.

As mentioned, perceived job risk refers to employees' perceptions of their own risk for injuries at work, and safety motivation should vary with respect to perceived job risk as well as occupational job risk. Using the health belief model (Janz & Becker, 1984) and protection motivation theory (Rogers, 1975) as theoretical frameworks, safety behavior is more likely to occur when individuals anticipate adverse consequences for their risky actions and have a genuine desire to decrease such actions that could lead to negative consequences at work (i.e., injuries and accidents). Although such desire has repeatedly been demonstrated as insufficient for actual change (Armitage & Conner, 2001; Carpenter, 2010), it is at least a necessary first step. For example, perceived job risk was found to serve as a necessary precursor to protective behaviors (Will & Geller, 2004) and has also been linked to work-related injury reduction (Gabel & Gerberich, 2002). Some have even suggested that until individuals increase their risk perceptions in certain environments, safety behaviors and outcomes cannot be significantly improved (van der Pligt, 1996). Indeed, Christian and colleagues (2009) found a moderate relationship between perceived job risk and safety motivation, and perceived job risk has previously been linked to other safety outcomes at work (Mullen, 2004).

H3: Perceived job risk will positively predict safety motivation.

Finally, perceived risk can be posed as the explanatory mechanism that transfers at least part of the variance of occupational risk to safety motivation. According to the health belief model and the protection motivation theory, risk present in a given context needs to be perceived by the individual worker in order to result in safety motivation. In other words, unless the worker perceives that he (or she[1]) is at risk to the hazards in their workplace, the worker may not be as motivated to engage in safety behaviors because of his own decreased susceptibility. This relationship has been explored in the medical field, with specific respect to AIDS. For example, research has demonstrated that, despite individual (demographic) and contextual (social) risk for contracting AIDS, those at such risk must perceive themselves to be above some baseline level of risk in order to engage in preventive behaviors (Kowalewski, Henson & Longshore, 1997; Prohaska, Albrecht, Levy, Sugrue & Kim, 1990). This frames perceived risk as playing a crucial role in connecting the relationship between risk and attitudes, however, because this relationship is complex and contingent on several contextual and individual facets, perceived risk –

[1] Given the focus of this project is on the impact of masculinity ideology on safety, the pronoun “he” will be used throughout.

although a necessary precursor for attitude and behavior change – may not completely account for all tne nuances of this relationship. Thus, I propose that perceived job risk should partially mediate the relationship between occupational job risk and safety motivation.

H4: Perceived job risk will partially mediate the relationship between occupational job risk and safety motivation.

Men's Risk for Accidents, Injuries, and Fatalities – In General and At Work

Before explicitly incorporating gender into the model of antecedents of safety motivation just presented, a brief overview of men's specific occupational risks is needed, followed by a discussion of the role of gender in understanding men's occupational risks.

Although men's health risk stretches over a wide spectrum, a significant portion of this risk resides in men's general propensity for accidents, injuries, and fatalities[2]. This specific area of men's health risk is an international phenomenon that reaches across cultures, and Morrongiello and Dayler (1996) are quick to state that "one of the most robust epidemiological findings is that boys are at greater risk of injury than girls" (p. 103). Unfortunately, this trend extends well into adulthood as well (Courtenay, 2011). Consistent evidence across 17 European countries demonstrates that 60% of male deaths between the ages of 1 and 24 are attributable to external causes (e.g., road traffic accidents, risk taking, suicide), which men are 3.5 times as susceptible to as women (White & Cash, 2004). Likewise, 44 countries from the World Health Organization Mortality Database were examined in a similar study and found that men exhibited higher

[2] In this paper, the term "fatality" refers to a rate of death due to injury, accident or disease in a defined population. Similarly, the term "fatal injury" is used to refer to an occupational injury incurred which results in death.

rates of deaths from accidents than women, a finding which persisted across all age groups in two-thirds of the countries examined (White & Holmes, 2006). The Center for Disease Control (CDC) has demonstrated that accidents account for the largest cause of death in men until age 45 and that there is an average rate of accidental deaths of nearly 60 per 100,000 men between the ages of 20 and 54 (Heron & Tejada-Vera, 2009) with similar trends emerging in Canadian populations (Phillips, 2006).

In addition to these general trends, a large percentage of the injuries and accidents men incur are during the time they are working (Courtenay, 2011; Khlat, Ravaud, Brouard & Chau, 2008; Meryn, 2008; Swaen, van Amelsvoort, Bültmann, Slangen & Kant, 2004). Men in the US are 10 times more likely to incur an occupational injury than women (Dodson, 2007). In 2008, although men overall worked only 14% more hours than women, male workers comprised 93% of the reported 5,214 fatal workplace injuries in the United States (US Department of Labor, 2008b).

Such sex differences in injury rates have been linked to differences in exposures. Using data from the US Department of Labor and US Census, Krantz (2002) ranked 250 occupations on several various dimensions, including physical demands, stress, and occupational hazards. Twenty-four out of the 25 overall worst jobs, as defined by the dimensions investigated, were found to have a workforce comprised of at least 95% men (Farrell, 2001; US Department of Labor, 2010). Other findings have suggested that even in the same occupations, men and women may experience different risks for injuries (Bauerle & Magley, 2011). Also, in an assembly line sample, men were significantly more likely than women to lift loads over 55lbs, work with the hands below knee level, keep the neck bent backwards, walk for prolonged time periods, kneel or squat for prolonged time periods, force exertion with the hands or arms, and operate a vehicle (Hooftman, van der Beek, Bongers & van Mechelen, 2005). Operating a vehicle is particularly dangerous, as it carries the highest frequency of fatal occupational injuries (US Department of Labor, Bureau of Labor Statistics, 2008b).

Explaining Men's Risk through a Gendered Lens

Given these findings, certainly the case can be made for the existence of men's occupational health disparities. However, men's risk lies beyond a mere exposure framework (Bauerle & Magley, 2011). In other words, despite the fact that men are clearly overrepresented in dangerous contexts, it is the masculine-based attitudes and values placed upon the risks in these contexts that place men at even greater risk. Robertson (2007) articulated this distinction: "In work on masculinity and health, men are represented at various times as both 'risk takers' and those 'at risk' and these two risk rhetorics are often combined to form a circle of explanation regarding men's health. That is to say, the 'risk taking' is, at least in part, seen as responsible for the mortality/morbidity that situates them as 'at risk'" (p.74).

In short, the findings described previously demonstrate that, from many aspects, men are a group at risk. What is still lacking, though, is an explanation for why men are at risk. The gendered explanation that I turn to next suggests that masculine values and attitudes further compound men's risk, with particular attention to men's occupational health risk.

Before detailing the role of masculinity of understanding men's risk, it is important to clarify that this is a *gendered* explanation. Nearly all of the men's health research and data cited thus far treats gender as a binary variable (i.e., male and female).

However, this implies a *sex difference* rather than a *gender difference*. That is, in psychological research, sex differences in data rarely have a “cut-and-dry,” binary, biological explanation, especially in the health behavior literature (Courtenay, 2002). Rather, men and women’s behavioral patterns are significantly affected by differing gender roles – i.e., scripts and cues for appropriate gender-aligned behavior (Bem, 1974; Spence & Helmreich, 1978). In other words, gender role theory (e.g., Cochran, 2010) suggests that observed epidemiological health differences between sexes are a function of socialized norms surrounding male- and female-ness (i.e., gender). Such socialized norms for maleness have the potential to negatively restrict men’s available repertoire for socially validated behavior, and the men and masculinity literature refers to this concept as masculinity ideology (Pleck, Sonenstein & Ku, 1993). Masculinity ideology thus refers to men’s experiences of a common set of standards, expectations, values and attitudes associated with the traditional male roles, which are largely negative, unrealistic and unattainable. Such expectations are acquired and internalized as values, which can lead to role conflict and negative psychological states. Some values and attitudes prescribed by masculinity ideology include self-reliance, dominance, being overly strong or tough, welcoming danger, never revealing vulnerability, and distancing oneself from femininity.

When these values and attitudes are applied to the workplace safety literature, several gendered explanations become apparent for why men are at higher risk for injuries and accidents. In Courtenay’s (2002, 2011) exhaustive literature review, he argues that men’s injury rates are due in large part to the normalization of risky behavior (as per masculinity ideology), and that this may not only drive men’s exposure to hazard-prone industries but reinforce dangerous “tough guy” expectations among men within these industries (Gregory, 2006; Iacuone, 2005). Thus, such values could be competing against organizational values of safe practices within risky occupations.

The concept of gender influencing occupational safety behavior and attitudes has been suggested in a limited variety of studies. Several qualitative exploratory studies using interview data examined men in non-traditional occupations, and found that men working in a feminine environment with task-flexible jobs are more likely than women in the same job to take on physically demanding tasks in an effort to cognitively restructure the feminine job to more closely align with their own masculine identity (Cross & Bagihole, 2002; Shen-Miller, Olson & Boling, 2010; Williams, 1993). Oftentimes, “dirty work” and dangerous or difficult tasks are conceptualized as part of a masculine identity for blue-collar workers (Ramirez, 2010). Even while completing hazardous tasks, men have demonstrated a greater likelihood to engage in behaviors indicative of masculine “toughness.” Men are more likely to evaluate their own safety and well-being as secondary to completing a task, exerting competence, or establishing toughness to coworkers (Breslin, Polzer, MacEachen, Morrongiello & Shannon, 2007; Gregory, 2006; Iacuone, 2005).Young male workers, when compared to their female coworkers, are more likely to view injuries as “part of the job” and are more likely to stifle complaints concerning injuries and hazards in order to appear mature (i.e., physically capable) among coworkers (Breslin et al., 2007). This suggests that trends of under-reporting occupational accidents and injuries may be a gendered phenomenon. Additionally, men are less likely to take time off, talk with a supervisor, or consider leaving their present job if they believe work is affecting their health in a negative and debilitating manner (Sharpe & Arnold, 1999).

Together, these findings highlight the importance of considering gender as an agent which affects observable sex differences in occupational injuries. Although the above-cited literature suggests the saliency of gender in organizational safety, by and large, safety research has not fully addressed the role of gender in occupational injuries and organizational safety behavior. Likewise, although the men and masculinity literature has assessed the overall health risks of men in occupations, it has not demonstrated the empirical connections between existing safety models and gender. The specific role gender has to play in determining occupational accidents/injuries remains somewhat unclear in both the safety and masculinity literatures. Research that can draw from both areas is needed to address the relationship between gender and the job-related injuries of male workers. Specifically, I argue that research exploring the role of gender in differentiating men and women on antecedents to safety attitudes and behaviors – and how gender affects the relationship between these antecedents and safety attitudes/behaviors – is key to understanding the magnitude of men's elevated risks for injuries.

The Moderating Role of Masculinity

As highlighted above, at the crux of the current investigation is masculinity, by which I refer to the negative attitudes, ideals and beliefs associated with the masculine gender role. Masculinity should moderate the proposed relationships in the mediation, particularly with respect to the relationship between occupational risk and perceived job risk. Masculine men may be less likely to perceive themselves at risk in spite of the occupational risks inherent in their environments. The masculine concept of self-reliance has specifically been viewed from a health lens (Nobis & Sanden, 2008), with the most detrimental outcomes reserved for men of traditional masculine gender role orientations (i.e., high self-reliance). This finding has also been replicated in older men who had suffered either a spinal cord injury or traumatic brain injury (Good, Schopp, Thomson, Hathaway, Mazurek & Sanford-Martens, 2008). Needless to say, men conforming to masculinity ideology may not have the same expectancy-values placed on occupational risk because of competing values of resiliency and toughness.

H5: Masculinity will moderate the relationship between occupational and perceived job risk, such that higher scores of masculinity will attenuate the relationship.

Likewise, the relationship between perceived risk and safety motivation should be moderated by masculinity. Masculinity theorists point out that risk control, or owning up to the responsibility of assuming risk for one's actions, seems to exist outside men's gender role conceptualizations (Robertson, 2007). This concept is empirically replicated in literature on preventive health, in which men are less likely to engage in preventive and restorative medical practices in nearly every area of health, despite equal or increased risk for certain diseases and conditions (Bonhomme, 2007; Courtenay, 2004; Peak, Gast & Ahlstrom, 2010; Wilkins, 2005). Thus, even if men are at higher risk for negative health-related outcomes, this does not always translate into preventative health behavior for men.

H6: Masculinity will moderate the relationship between perceived job risk and safety motivation, such that high masculinity will attenuate the relationship.

Method

Participants and Procedure

Students enrolled in introductory psychology courses at a large public university in the northeast received extra credit points toward their final course grade by either (1) forwarding a link of an online survey to friends or family members who work full-time or (2) completing the online survey themselves, provided that they were working in a full-time job. To effectively recruit participants working in safety conscious occupations (i.e., jobs in which safety issues would be more prevalent), special effort was made to recruit individuals working in a job that had some aspect of physical work or manual labor. Once participants arrived at the survey web page, they were informed about the purpose of the study, their rights as a participant, a guarantee of their anonymity, and that the survey would take approximately 20 minutes to finish. (Other measures were included in the online survey that contributed to other research projects and were unrelated to the present study.)

An initial sample of 652 participants completed the survey. Participants were excluded from the survey based on a number of criteria. Due to the gendered nature of the study and the constructs of interest, all female participants (330 participants) were excluded from the study. Likewise, eight participants who did not report their sex were also excluded.

Additionally, participants were excluded on the basis of reported job title. Nearly 20% of the original sample (123 participants) did not report complete job title information and thus O*NET occupation information could not be gathered for these individuals, which led to their exclusion from the study. Further, participants that had job titles indicative of occupations which did not have physical work or manual labor components (203 of the 652 original participants) were also excluded. An additional 72 participants were excluded on the basis of missing O*NET data because O*NET does not keep data on various “miscellaneous” job titles.

These exclusion procedures left 173 participants retained in the data with jobs indicative of safety components. Seventeen of these participants could not be included in the analyses due to incomplete, missing, or fraudulent data, leaving a final sample size of 156 participants.

Mean age of these participants was 31 years (SD=13.9). Average hours worked per week was 33 (SD=18.8), and average job tenure was 6.86 years (SD=9.5). A majority of the sample was white (83%), had at least a partial college education (72%), and single (55%).

Measures

Table 1 contains basic scale descriptive information, internal consistency measures (Cronbach’s alpha), and the inter-construct correlation matrix. Items are listed in the Appendix.

Occupational risk. To measure occupational risk, variables were extracted from the Occupational Information Network (O*NET) database. O*NET is a free-of-use online database which contains measures of the psychosocial characteristics of occupations, including a large number of quantitative variables that describe various facets of the occupation itself, such as substantive complexity, perceptual and motor skills, and physical demands and hazards (Hadden, Kravets & Muntaner, 2004). In the present study, participants were asked for their job titles and a brief description of the tasks and responsibilities included in their day-to-day job routines. This information was then used to obtain a Standard Occupational Classification (SOC) code for each response that best portrayed the job description provided by participants. Coding was conducted by undergraduate and graduate research assistants, and the accuracy of these coding decisions was verified by the lead author on the current research. SOC codes were then cross-referenced to those provided by O*NET, and Work Context variables were imputed by job code into the dataset. Specifically, variables from the physical working conditions subdomain of the Work Context variables were used to create an occupational risk construct. These physical working conditions include variables which represent the interaction between worker and physical job environment, such as work setting, environmental conditions, and occupational risks and hazards (Peterson, Mumford, Borman, Jeanneret, Fleishman, Levin et al., 2001). Greater elaboration of the scale construction for the occupational risk construct used in the present study is included in the Results section.

Perceived risk. A 1-item measure of perceived risk was drawn from Greening (1997) and used in the present study: *Compared to your coworkers, how likely do you think it is that you will incur an injury at your job?* This provided a comparable baseline for assessing an individual's perceived risk, which has some added value given the perceptual emphasis of the present study. For example, when asking cancer patients about their perceived cancer risk, it is necessary to compare their own risk against the risk of other cancer patients so as to obtain a more stable self assessment (Leventhal, Kelly & Leventhal, 1999). A 5-point response scale (from "Very Unlikely" to "Very Likely") was used for this single item indicator of perceived risk.

Safety motivation. Safety motivation (α=.90) was measured using 7 items (on a 7-point Likert scale from “Strongly Disagree” to “Strongly Agree”) provided by Vinodkumar and Bhasi (2010), who combined scale items from Griffin and Neal (2000), Zohar (1980), and others. Validity was established through discussion of the items with safety executives, pilot testing, and confirmatory factor analyses, which resulted in CFIs above .97 and alpha reliabilities above .72 for all scales included in their validity study.

Masculinity. Six items from the Risk Taking Subscale of the Hypermasculinity Index (Peters, Nason & Turner, 2007) were used as a measure of masculinity in the present study. The Risk Taking Subscale (α=.77) conceptualizes risk as the attitudes surrounding danger, and Mosher and Sirkin (1984) argue that the tendency to view danger as viable and socially acceptable is a component of socialized masculinity. Several studies have found interactions between the Hypermasculinity Index, sex, and both aggression after drinking (Mosher & Anderson, 1986) and aggressive driving (Krahe & Fenske, 2002). Methodologically, the Hypermasculinity Index is unique in that it combines forced choice and degrees of endorsement by posing polar extreme responses on a non-anchored 10 point scale, maximizing variability in responses and allowing respondents to indicate very slight endorsement of socially undesirable responses (Peters, Nason & Turner, 2007). This was seen as a preferable characteristic of the scale, as other masculinity scales contain items that can explicitly access participants’ social desirability and therefore result in skewed distributions. Additionally, risk taking is a masculine concept that is particularly relevant to the safety context (as with the present study), providing a more focused measure of a single dimension of masculinity than a general measure of masculine ideology. Peters et al. (2007) calculated the Cronbach’s alpha at

.90 for the Risk Taking Subscale, and their exploratory factor analysis on the Hypermasculinity Index indicated adequate loading on the Risk Taking factor with all factors accounted for more than 50% of the variance.

Results

Occupational Risk Scale Development

Previous work by Hadden and colleagues (2004) have lead to the development and validation of core O*NET factors, including a “physical demands” factor. However, this physical demands factor, which combines the physical work conditions as well as sensory and physical abilities needed to perform in a given occupation, is substantively different from a factor that encapsulates the degree of accident/injury risk that an average worker may incur in a given occupational context. Further, although some sensory and physical abilities do imply greater risk (for example, a need for dynamic strength in a certain occupation implies a greater level of risk than an occupation with a low need for dynamic strength), it is necessary to distinguish injury risk and accident risk in the development of an occupational risk scale. Because the current study focuses on the behavioral aspects of safety, a greater focus for accident-inducing contexts (and characteristics) is needed over injury-inducing characteristics (and contexts). Therefore, a unique scale development effort was needed for the creation of an occupational risk construct.

A pool of initial items (Table 2) was drawn mainly from the physical work condition subset of the O*NET Work Context domain, although a few relevant items were also included from the work output subset of the Work Activities domain, and one item each was drawn from the interpersonal relationships and structural job characteristics subsets of the Work Context domain. Previous construct development efforts with O*NET items has focused on consolidating between-item variability by reducing as few components/factors as possible (Bandalos & Boehm-Kaufman, 2009; Hadden et al., 2004). While the goal of the present research is to obtain a unified score that represents occupational risk, I argue that identifying the most commonly grouped risk items will not adequately represent the complexity inherent in occupational risk. For example, *operating an enclosed vehicle* may not load onto the same factor as *exposed to high places*, however, both of these items contribute significantly to the idea of occupational (or structural job-based) sources of risk via increased chance of accidents.

In an effort to create a summary occupational risk score from the O*NET data, I opted to isolate the O*NET items that would best discriminate among groups of jobs that differ with respect to safety saliency. In light of this, a 2-phase approach was used. First, a *k*-means clustering analysis was conducted on the O*NET data to identify the groups of jobs that differ meaningfully with respect to safety. Second, a discriminant function analysis was then conducted on these *k*-means derived groups, to arrive at a single, linear combination of core discriminating variables to create the occupational risk score that could then be merged into the survey data. To be clear, the aforementioned 2-phase approach, which is detailed below, was conducted on all 806 job titles represented in the O*NET database, not the survey data collected for the present study. This was done to better establish content validity for the occupational risk measure and to frame the risk inherent in the job titles represented in the survey data within the risk of other jobs represented in the O*NET data.

K-means clustering. In short, *k*-means clustering aims to partition *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean. It is a type of cluster analysis, meaning that the goal is to group observations that are similar to each other. In the present study, the working assumption is that jobs which are "high risk" will be more similar to one another, and consequently will be more dissimilar to jobs which are "low risk." Thus, the previously identified O*NET job risk items were entered into a *k*-means clustering analysis. Several cluster solutions were investigated. Ideally, the cluster solution that is retained should contain enough clusters to capture the complexity and variance in *n* observations while at the same time leaving a non-exhaustive, parsimonious number of clusters[3]. Although other solutions were investigated, a parsimonious 3-cluster solution was generated whereby the analysis produced three groupings of jobs based on the O*NET items. Interpretation of the clusters was based on the cluster centers, which can be thought of as factor loadings in the sense that the centers give an indication of the strength of association between an item and the cluster itself. In other words, the cluster center is the mean value of a particular item in a given cluster; see Table 3.

One cluster emerged which encapsulated jobs that were indoors (environmentally controlled) and required workers to spend time sitting for prolonged periods of time. Jobs belonging to this cluster were typically "white collar" knowledge-based jobs in an office context (e.g., training and development managers, office clerks, education administrators,

[3] As part of the *k*-means analysis, an ANOVA is executed which investigates significant differences in items across groups. In short, the ANOVA signifies how strongly items are distinguishing the clusters, thus the higher the F values, the more the item is being used to differentiate one cluster from the others. During these solution iterations, five previously identified O*NET job risk items were left out of further analyses: exposure to radiation, exposure to whole body vibration, wearing specialized (i.e., uncommon) protective or safety equipment, physical proximity, and time spent making repetitive motions. These items produced uniformly low cluster centers among the group and had the lowest F values given all items investigated, indicating low cluster differentiation.

secretaries, travel agents), and thus this group was named, "Safe Jobs." This group also contained the largest number of cases, as 304 out of 807 jobs were categorized under this cluster.

The second cluster described jobs in which workers also predominantly worked in environmentally controlled indoor spaces, yet when compared to the "Safe Jobs" cluster, workers in this cluster were much more likely to spend time standing, perform general physical activities, and handle and move objects. Jobs belonging to this cluster were typically hand or tool oriented and contained a more moderate amount of risk compared to the "Safe Jobs" cluster (e.g., vocational education, mail sorters, packagers, fabric menders, shoe repairers). Thus this cluster was named, "Elevated Risk Jobs." This cluster contained 263 jobs.

The final cluster contained jobs which included wearing required common protective gear or safety equipment, performing general physical activities, being exposed to hazardous equipment and conditions, and operating vehicles, mechanized devices, or equipment. Jobs belonging to this cluster typically had the greatest amount of risk when compared to the two previous clusters (e.g., sheet metal workers, carpenters, construction laborers, landscapers, commercial drivers). This cluster was named, "High Risk Jobs," and contained 242 jobs.

Discriminant function analysis. Although the *k*-means analysis provides information on the groups of jobs that differ in terms of their safety saliency, a Discriminant Function Analysis (DFA) is needed to determine quantitatively *how much* these groups vary in safety saliency in the form of an occupational risk score. Specifically, a DFA is used to determine the linear combination of variables which best discriminates among categorical groups. In other words, a DFA works as a reverse MANOVA: instead of investigating group differences among several outcome variables, an array of predictor variables is used to discriminate between group membership. These predictor variables are combined into *functions* which are then used to *discriminate* between ad-hoc groups (hence, discriminant function). Importantly, the resulting discriminant score – which is a linear, weighted combination of the standardized canonical discriminant function coefficients and ranges from 0 to 1 – represents a job's overall measure of occupational risk.

The first step in the present discriminant function analysis was identifying a parsimonious set of predictors that would discriminate among the three clusters via a rational-empirical approach. Empirically, key discriminating O*NET items were first identified as having *k*-means clustering F-values in the upper 50^{th} percentile, indicating that they better differentiated among the groups. (See Table 4 detailing the item-by-item ANOVA F-values from the cluster analysis.) Secondly, from a rational perspective, an effort was made to include items that broadly conceptualized risk, while still predicting accidents and injuries. A 2007 report from Liberty Mutual details both the top 10 causes of disabling injuries (based on Bureau of Labor Statistics data) as well as the respective national costs to industries as a result of these injuries (e.g., medical bills, workers comp, lost productivity). This information was used as a rough selection guide for including certain O*NET items which might contribute to these disabling injuries. For example, "Exposed to Hazardous Equipment" was retained in the DFA not only due to its high F value in the cluster analysis but to its relevance in determining the occupationally-based causes for such injuries as being struck by or struck against an object and caught in/compressed by equipment. Given the goals of the present study, it was appropriate to include some of the same items used in the *k*-means analysis in the DFA as well. This allows key O*NET items to both create the clustered groups (in combination with the other relevant O*NET items) and the discriminant scores, which reflect weighted combinations of these key items. See Table 6 for the list of the final six items that were included in the DFA.

Results of the DFA analysis can be found in Table 7. Because a DFA always returns a number of functions equivalent to n-1 (where n=the number of groups in the outcome variable), two functions were derived from the analysis. The first function accounted for 96% of the variance in discriminating among the groups. Further, the squared canonical correlation (roughly equivalent to an R^2 in regression) indicates that the first function correlates highly with group membership such that 87% of variance in group membership can be explained by the first function. Thus, the discriminant score for the first function was saved to the O*NET data set. Again, this discriminant score represents a linear, weighted combination of key O*NET items based on the standardized canonical discriminant function coefficients (see Table 8), and is conceptualized in the present study as the occupational risk value for the job. For the remainder of the manuscript, these first function discriminant scores will be referred to as a job's *occupational risk*.

Mediation Model

To test Hypotheses 1 through 4, Baron and Kenny's (1986) mediational regression steps were employed, whereby a significant relationship between the predictor and outcome is established (H1), followed by a significant relationship between the predictor and the mediator (H2), then a significant relationship between the mediator and the outcome (H3), and finally demonstrating that the relationship between the predictor and the outcome approaches zero once the mediator is controlled for (H4).

Using the correlation matrix as a guide (see Table 1), it was determined that occupational risk, perceived risk, and safety motivation are all positively and significantly correlated. Following the Baron and Kenny steps, occupational risk predicts safety motivation ($\beta=.17$, $p<.05$) and accounts for 3.8% of the variance in the safety motivation variable, thus H1 was supported. Occupational risk also predicts perceived risk ($\beta=.294$, $p<.001$) and accounts for 8.5% of the variance in perceived risk, lending support to H2. Perceived risk predicts safety motivation ($\beta=.16$, $p<.05$) and accounts for 2.5% of the variance in safety motivation, supporting H3. Finally, as shown in Table 9, the occupational risk beta dropped yet remained significant when perceived risk was introduced into the regression (.17 to .14). Additional probing revealed a nonsignificant indirect mediational effect through the use of Hayes' Sobel Test (.04, $p>.10$), though a Sobel test may not be appropriate for a mediation with the small sample size available in the current study. However, the test of joint significance (Mallinckrodt et al., 2006) is both sufficient for establishing mediation in the current study and appropriate given the small sample size available. Thus, evidence for partial mediation was found, lending support to H4.

Mediated Moderation

Preacher, Rucker and Hayes's (2007) SPSS macro was used to explore the moderated mediation model, introducing masculinity as a moderator at both legs of the mediation. Table 10 shows the results of the analysis. In the first leg of the equation, masculinity has neither a main effect nor interacts with occupational risk to significantly predict perceived risk. Thus, H5 was not supported. However, in the second leg of the analysis, masculinity predicts safety motivation as a main effect and additionally interacts with perceived risk to significantly predict safety motivation, such that the relationship between perceived risk and safety motivation is attenuated by low masculinity; see Figure 2. This is in contrast to the hypothesized relationship, which stated that high masculinity would attenuate the relationship. Thus, H6 was not supported.

Interestingly, as part of the larger examination of the role of masculinity in linking risk to safety motivation, masculinity was also examined as a buffer between occupational risk and safety motivation. Masculinity was found to interact with occupational risk in predicting safety motivation was found, such that high masculinity does attenuate the relationship between occupational risk and safety motivation; see Figure 3. Specifically, a significant conditional indirect effect was found for masculinity (see Table 11), such that the effect of masculinity from occupational risk to safety motivation through perceived risk is significant at higher levels of masculinity.

Discussion

The goal of the present research was to investigate how masculinity roles and norms contribute to understanding safety risk and motivation in the workplace. Indeed, masculinity does have a role to play in the concepts explored, though its role may be more complex than anticipated. First, masculinity did not significantly predict perceived risk. This was an interesting discovery, given the aforementioned arguments earlier in the manuscript that men ascribing to more traditional masculine gender roles would be less likely to notice the risks in a given scenario. Meta-analytically, the relationship between gender (sex) and risk taking has been shown to be quite strong and consistent, even across age groups and types of risk taking (Byrnes, Miller & Schafer, 1999). Byrnes et al. argue that men and women hold different expectations and values around risk, and it is these attitudes that affect risk-taking behavior. Perhaps then, the relationship between risk perception and risk taking has been oversimplified in the safety literature, where perceived risk is either measured using a one-item *probability of injury* survey construct (e.g., “I think there is a good chance I will get injured on the job,” Huang et al., 2007), or in response to industry- and site-specific workplace facets and common work accidents (e.g., “How likely are you to be injured by falling to a lower level?”, Rundmo, 1996). These items may be tapping into the outcomes of workplace-specific risk attitudes instead of the attitudes themselves. Using the health belief model and protection motivation theory as frameworks, the relationship between perceived risk and protection motivation is contingent upon available heuristics (Tversky & Kahneman, 1974): not only judgments based on injury frequency but also consequences of injury, affect-attachment to injury (e.g., dread, pain), benefit of risky behavior, and a direct connection between risk and injuries. Given the potentially rich perception- and attitude-laden nature of this construct, further psychology-specific construct development is needed to investigate the judgments and characteristics involved in the risk perception process.

The interaction between masculinity and perceived risk differed from what was expected. At low levels of masculinity, perceived risk made little difference in determining safety motivation (i.e., low masculinity attenuated the relationship). It is especially interesting comparing this finding with the unexpected interaction between occupational risk and masculinity in predicting safety motivation, such that in this interaction, at high levels of masculinity occupational risk made little difference in determining safety motivation (i.e., high masculinity attenuated the relationship). As a type of personality dimension, conformity to the masculine gender role, especially at high levels of conformity, is likely to be context independent. Thus, regardless of the risk inherent in the occupation itself, highly masculine workers may not be motivated to work safely, whether that work is pushing papers, lifting boxes or fighting fires. However, due to the context- and individual-specific nature of perceived risk, masculinity may not operate in the same way. Masculine workers who do cognitively acknowledge some degree of risk may be motivated to protect themselves beyond the prescribed risky nature of traditional masculinity. In this sense, making acknowledgement of risk compatible with traditional masculinity may prove to be a vital component for safety practitioners. The difficult piece for practitioners then becomes how to instill vulnerability (at least, acknowledged vulnerability to workplace accidents and injuries) in a population traditionally known for going to great lengths to not appear weak.

As stated, the results give credence to using men and masculinity concepts in exploring safety-related phenomena in organizations. The present study established evidence that gender affects relationships between risk and safety, but further development is needed when it comes to researching masculinity-relevant facets in the workplace. Indeed, in a recent critique on the men and masculinity literature, Addis, Mansfield and Syzdek (2010) argue that masculinity as a construct is too focused on the individual differences (personality) dimensions of gender and should start investing in the social-learning dimension of masculinity and address contextual as well as dispositional domains, such as the *how* and *why* of the masculine value-learning process. In truth, we know very little about the *how* and *why* of masculinity from an empirical perspective and in a general setting, let alone a workplace setting. How is masculinity negotiated in the workplace? Is the masculine gender role stable (i.e., a personality facet), and therefore do we need to investigate men's self-selection into dangerous occupations? Or is the masculine gender role more dynamic, and therefore is developed, encouraged, and collaborated at work through enforcement behaviors? Further, O'Neil (2010) builds on Addis et al.'s arguments and maintains that investigating specific facets of masculinity (instead of the generic concept of masculinity itself) may be an appropriate way forward, and that historically specific masculinity research has positively contributed to understanding of men's problems. Developing sound constructs that allow for the investigation of masculinity specifically in the workplace setting (e.g., masculinity climate, toughness/safety policing behavior, masculinity-safety tension) would give much needed breadth to a construct that historically has had strong roots outside the domain of organizational sciences.

Related to concerns about construct development, the measure of masculinity used in the present research – the "Danger As Exciting" subscale of the Hypermasculinity Index – might have tapped too narrowly into the construct, which could explain the unanticipated results. On the one hand, the Hypermasculinity Index (HMI) does not directly measure masculinity ideology, which is theorized to precede the behaviors and cognitions associated with the traditional masculine gender role. Masculinity ideology, as stated earlier, refers to men's experiences of a common set of standards, expectations, values and attitudes associated with the traditional male roles. These attitudes about men's appropriate behavior then filter down into individual-level cognitions and experiences (e.g., gender role conflict). The specific facet of hypermasculinity included in the present study could be framed as an outcome of these role-constricting beliefs, and the argument could be made for investigating the role of global masculinity ideology values and attitudes with the present relationships studied. On the other hand, despite these concerns, hypermasculinity was selected specifically for the present study partly because of its unique psychometric qualities. Instead of asking participants to respond directly to barefaced statements about men and masculinity values (as is common with many masculinity measures), a 10-point scale is offered with anchors only at the polar ends of the scale (see the description in the “Measures” section). In this way, the scale was developed to reduce the skewed response distribution and range ristriction often seen in men and masculinity research (Peters, Nason & Turner, 2007) and indeed the distribution in the present study was found to be fairly uniform.

The measurement of occupational risk also warrants further attention. Although occupational risk was conceptualized as unidimensional in the present study for simplicity, it could very well be that occupational risk is a multidimensional construct, where the multidimensionality has real implications for men and masculinity investigations in the workplace. For example, the occupations with the greatest gender-based fatality disparity are truck drivers, ranchers, construction laborers and grounds maintenance workers. Are men more susceptible to risk stemming from machines/equipment? Does working in solitary environments (i.e., limited interaction with coworkers) increase risk specifically for men (or, for men more than women)? A more complex investigation of occupational risk and workplace-specific masculinity construct development could be used to further isolate the areas of risk for working men.

Implications and Conclusions

The findings offer solid implications for safety practitioners and supervisors of “safety conscious” occupations. First, the present study has established that masculinity does interact with various risk constructs to predict safety motivation. Although safety trainers may get information concerning populations at greater risk, such as women and racial minorities, men are all too often not included in this conversation (either because men are viewed as the majority group or that men comprise most of the workers in such fields). From a cultural perspective, the “culture of masculinity” contributes to risk and safety in the workplace, and therefore practitioners should be knowledgeable about the risks present in traditional masculinity conceptualizations. Beyond increasing knowledge surrounding men’s increased risk, “male friendly” approaches might be valuable to use when creating safety-related organizational interventions (Courtenay, 2000; 2011). For example, Courtenay advocates for using action-oriented, problem-solving and goal-setting approaches to preventive health programs targeted at traditional men. He makes the case that by making health initiatives more objective (i.e., less affective-based/more depersonalized), by including messages that reframe health as being compatible with the masculine gender role (e.g., “be a man, be healthy”), by highlighting men’s vulnerabilities to health problems in a fact-based manner and by reframing healthy behavior for men as a means of acting responsible for their families/friends/coworkers, such interventions can be more successful for men. In this way, safety practitioners can be savvier as to the health and safety arguments that work with traditional men and reframe safety program messages to fit the needs and values of traditional men.

In conclusion, the results from the present study suggest that men are still a vulnerable population and that safety-related research should pay attention to the influence of gender roles. The call for reducing fatal and non-fatal injuries among vulnerable populations is nothing new, at least not to safety and health researchers. The National Institute for Occupational Safety and Health (NIOSH), a subsidiary of the Center for Disease Control (CDC), has a program solely devoted to occupational health disparities which aims to examine the "differences…in morbidity and mortality that exist among specific populations" (NIOSH, 2011). Although the program focuses on racial and ethnic minority workers, I argue that the gender of these workers is also a vital consideration. Indeed, NIOSH (2001) released a *surveillance strategic plan,* which in part outlined particular industries and populations that are both at risk for occupational injuries and lack scientific exposure (agriculture, construction, mining, and health care). With the exception of health care, the remaining fields are male-dominated fields, with male worker composition of no less than 80% in each industry. Hence, although NIOSH may not have intended to do so, its call for industrial hazard reduction is at least in part an avocation for the continued study of men's workplace well-being.

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Appendix
Scale Items

Perceived Job Risk Item (Greening, 1997)
Compared to your coworkers, how likely do you think it is that you will incur an injury at your job?

Safety Motivation (Neal & Griffin, 2006; Vinodkumar & Bhasi, 2010)
I feel that it is important to encourage others to use safe practices
I feel that it is important to promote safety programs.
I always point out to the management if any safety related matters are noticed in my company
I put in extra effort to improve the safety of my workplace
I voluntarily carry out tasks or activities that help to improve workplace safety
I encourage my co-workers to work safely.
I promote the safety program within the organization

Hypermasculinity Index, Risk Taking Subscale (Peters, Nason & Turner, 2007): Below are a series of incomplete statements, with two different options of how to complete the sentence at each end. Click on any one of the ten bubbles given for each incomplete statement that most closely represents how you would finish the sentence.
I'd rather…(gamble than play it safe/play it safe than gamble)
Some people have told me…(I take foolish risks/I ought to take more chances)
When I have a drink or two…(I feel ready for whatever happens/I like to relax and enjoy myself)
When it comes to taking risks…(I like to play it safe/I'm a high roller)
When I'm bored…(I watch TV or read a book/I look for excitement)
I like to…(drive safely, avoiding all unnecessary risk/drive fast, right on the edge of danger)

Table 1

Scale Descriptives and Correlation Matrix

Variables	*Mean (Std. Dev.)*	*Min.*	*Max.*	*Cronbach's Alpha*	*(1)*	*(2)*	*(3)*	*(4)*
Occupational Risk (ONET Data)	0.00 (2.74)	-4.44	5.58	--	--	--	--	--
(1) Occupational Risk (Survey Data)	1.85 (1.72)	-0.83	5.25	--	1			
(2) Perceived Risk	2.37 (1.10)	1	5	--	.29**	1		
(3) Safety Motivation	5.15 (1.00)	2.43	7	.90	.17*	.16*	1	
(4) Masculinity	4.94 (1.81)	1	10	.77	-.14	-.00	-.20*	1

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

Table 2

*Initial O*NET Items Used for the Development of an Occupational Risk Factor*

*O*NET Item*	*Description*	*O*NET Dimension*
Controlling Machines and Processes	Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles)	Work Activities – Work Output
Handling and Moving Objects	Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.	Work Activities – Work Output
Operating Vehicles, Mechanized Devices, or Equipment	Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.	Work Activities – Work Output
Performing General Physical Activities	Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials	Work Activities – Work Output
Repairing and Maintaining Mechanical Equipment	Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.	Work Activities – Work Output
Pace Determined by Speed of Equipment	How important is it to this job that the pace is determined by the speed of equipment or machinery? (This does not refer to keeping busy at all times on this job.)	Work Context – Structural Job Characteristics
Responsible for Others' Health and Safety	How much responsibility is there for the health and safety of others in this job?	Work Context – Interpersonal Relationships
Cramped Work Space, Awkward Positions	How often does this job require working in cramped work spaces that requires getting into awkward positions?	Work Context – Physical Work Conditions
Exposed to Contaminants	How often does this job require working exposed to contaminants (such as pollutants, gases, dust or odors)?	Work Context – Physical Work Conditions
Exposed to Disease or Infections	How often does this job require exposure to disease/infections?	Work Context – Physical Work Conditions
Exposed to Hazardous Conditions	How often does this job require exposure to hazardous conditions?	Work Context – Physical Work Conditions
Exposed to Hazardous Equipment	How often does this job require exposure to hazardous equipment?	Work Context – Physical Work Conditions
Exposed to High Places	How often does this job require exposure to high places?	Work Context – Physical Work Conditions
Exposed to Minor Burns, Cuts, Bites, or Stings	How often does this job require exposure to minor burns, cuts, bites, or stings?	Work Context – Physical Work Conditions
Exposed to Radiation	How often does this job require exposure to radiation?	Work Context – Physical Work Conditions
Exposed to Whole Body Vibration	How often does this job require exposure to whole body vibration (e.g., operate a jackhammer)?	Work Context – Physical Work Conditions

Extremely Bright or Inadequate Lighting	How often does this job require working in extremely bright or inadequate lighting conditions?	Work Context – Physical Work Conditions
In an Enclosed Vehicle or Equipment	How often does this job require working in a closed vehicle or equipment (e.g., car)?	Work Context – Physical Work Conditions
In an Open Vehicle or Equipment	How often does this job require working in an open vehicle or equipment (e.g., tractor)?	Work Context – Physical Work Conditions
Indoors, Environmentally Controlled	How often does this job require working indoors in environmentally controlled conditions?	Work Context – Physical Work Conditions
Indoors, Not Environmentally Controlled	How often does this job require working indoors in non-controlled environmental conditions (e.g., warehouse without heat)?	Work Context – Physical Work Conditions
Outdoors, Exposed to Weather	How often does this job require working outdoors, exposed to all weather conditions?	Work Context – Physical Work Conditions
Outdoors, Under Cover	How often does this job require working outdoors, under cover (e.g., structure with roof but no walls)?	Work Context – Physical Work Conditions
Physical Proximity	To what extent does this job require the worker to perform job tasks in close physical proximity to other people?	Work Context – Physical Work Conditions
Sounds, Noise Levels Are Distracting or Uncomfortable	How often does this job require working exposed to sounds and noise levels that are distracting or uncomfortable?	Work Context – Physical Work Conditions
Spend Time Bending or Twisting the Body	How much does this job require bending or twisting your body?	Work Context – Physical Work Conditions
Spend Time Climbing Ladders, Scaffolds, or Poles	How much does this job require climbing ladders, scaffolds, or poles?	Work Context – Physical Work Conditions
Spend Time Keeping or Regaining Balance	How much does this job require keeping or regaining your balance?	Work Context – Physical Work Conditions
Spend Time Kneeling, Crouching, Stooping, or Crawling	How much does this job require kneeling, crouching, stooping or crawling?	Work Context – Physical Work Conditions
Spend Time Making Repetitive Motions	How much does this job require making repetitive motions?	Work Context – Physical Work Conditions
Spend Time Sitting	How much does this job require sitting?	Work Context – Physical Work Conditions
Spend Time Standing	How much does this job require standing?	Work Context – Physical Work Conditions
Spend Time Using Your Hands to Handle, Control, or Feel Objects, Tools, or Controls	How much does this job require using your hands to handle, control, or feel objects, tools or controls?	Work Context – Physical Work Conditions
Spend Time Walking and Running	How much does this job require walking and running?	Work Context – Physical Work

		Conditions
Very Hot or Cold Temperatures	How often does this job require working very hot (above 90 F degrees) or very cold (below 32 degrees) temperatures?	Work Context – Physical Work Conditions
Wear Common Protective or Safety Equipment such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats, or Life Jackets	How much does this job require wearing common protective or safety equipment such as safety shoes, glasses, gloves, hard hats or life jackets?	Work Context – Physical Work Conditions
Wear Specialized Protective or Safety Equipment such as Breathing Apparatus, Safety Harness, Full Protection Suits, or Radiation Protection	How much does this job require wearing specialized protective or safety equipment such as breathing apparatus, safety harness, full protection suits, or radiation protection?	Work Context – Physical Work Conditions

Table 3

Final Cluster Centers for 3-Cluster Solution

	Safe Jobs	*Elevated Risk Jobs*	*High Risk Jobs*
Performing General Physical Activities	1.94	3.16	3.73
Handling and Moving Objects	1.95	3.15	3.76
Controlling Machines and Processes	1.83	2.76	3.61
Operating Vehicles, Mechanized Devices, or Equipment	1.56	2.23	3.59
Repairing and Maintaining Mechanical Equipment	1.37	2.10	3.13
Exposed to Contaminants	1.87	3.07	4.12
Exposed to Disease or Infections	1.51	2.21	1.53
Exposed to Hazardous Conditions	1.24	2.08	3.06
Exposed to Hazardous Equipment	1.23	2.10	3.72
Exposed to High Places	1.13	1.41	2.53
Exposed to Minor Burns, Cuts, Bites, or Stings	1.35	2.40	3.38
Extremely Bright or Inadequate Lighting	1.56	2.04	3.11
Cramped Work Space, Awkward Positions	1.44	2.04	2.98
In an Enclosed Vehicle or Equipment	1.90	2.12	3.03
In an Open Vehicle or Equipment	1.08	1.31	2.55
Indoors, Environmentally Controlled	4.32	4.10	2.71
Indoors, Not Environmentally Controlled	1.61	2.17	3.43
Outdoors, Exposed to Weather	1.60	2.11	3.53
Outdoors, Under Cover	1.33	1.63	2.42
Pace Determined by Speed of Equipment	1.41	1.90	2.76
Responsible for Others' Health and Safety	2.38	3.33	3.70
Sounds, Noise Levels Are Distracting or Uncomfortable	2.54	3.05	4.13
Spend Time Bending or Twisting the Body	1.55	2.56	3.21
Spend Time Climbing Ladders, Scaffolds, or Poles	1.10	1.26	1.96
Spend Time Keeping or Regaining Balance	1.16	1.61	2.09
Spend Time Kneeling, Crouching, Stooping, or Crawling	1.35	1.88	2.47
Spend Time Sitting	3.93	2.63	2.19
Spend Time Standing	2.34	3.51	3.85
Spend Time Using Your Hands to Handle, Control, or Feel Objects, Tools, or Controls	2.64	3.57	4.18
Spend Time Walking and Running	1.89	2.82	3.13
Very Hot or Cold Temperatures	1.51	2.20	3.64
Wear Common Protective or Safety Equipment such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats, or Life Jackets	1.43	3.07	4.45

Table 4

Cluster Analysis F-Value ANOVA Output

*O*NET Items*	*F*
Wear Common Protective or Safety Equipment such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats, or Life Jackets	1028.68
Exposed to Hazardous Equipment	997.66
Exposed to Minor Burns, Cuts, Bites, or Stings	919.99
Very Hot or Cold Temperatures	827.76
Exposed to Contaminants	826.16
Performing General Physical Activities	755.39
Handling and Moving Objects	751.71
Operating Vehicles, Mechanized Devices, or Equipment	670.86
Spend Time Bending or Twisting the Body	602.60
Extremely Bright or Inadequate Lighting	557.53
Cramped Work Space, Awkward Positions	546.33
Repairing and Maintaining Mechanical Equipment	542.81
In an Open Vehicle or Equipment	526.92
Controlling Machines and Processes	518.32
Indoors, Not Environmentally Controlled	476.34
Exposed to Hazardous Conditions	451.22
Sounds, Noise Levels Are Distracting or Uncomfortable	427.37
Spend Time Sitting	415.70
Exposed to High Places	381.62
Spend Time Kneeling, Crouching, Stooping, or Crawling	361.55
Indoors, Environmentally Controlled	357.01
Spend Time Keeping or Regaining Balance	356.24
Spend Time Standing	355.62
Spend Time Walking and Running	332.02
Responsible for Others' Health and Safety	302.04
Spend Time Climbing Ladders, Scaffolds, or Poles	298.69
Spend Time Using Your Hands to Handle, Control, or Feel Objects, Tools, or Controls	281.51
Outdoors, Exposed to Weather	263.92
Pace Determined by Speed of Equipment	214.63
Outdoors, Under Cover	198.31
In an Enclosed Vehicle or Equipment	88.40
Exposed to Disease or Infections	47.14

Table 5

Percentage of Survey Respondents by Occupational Risk Group

Cluster Names	*Participants*	*% of Total*	*Mean Masculinity (Standardized)*
Safe Jobs	15	10%	-.42[a]
Elevated Risk Jobs	86	55%	.23[ab]
High Risk Jobs	55	35%	-.24[b]

Note. Numbers that share a letter significantly differ in a paired difference test.

Table 6

*O*NET Items Used in Discriminant Function Analysis*

*O*NET Items*	*F*
Wear Common Protective or Safety Equipment such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats, or Life Jackets	1028.68
Exposed to Hazardous Equipment	997.66
Performing General Physical Activities	755.39
Handling and Moving Objects	751.71
Operating Vehicles, Mechanized Devices, or Equipment	670.86
Exposed to Hazardous Conditions	451.22

Table 7

Discriminant Function Analysis: Eigenvalues, Percent Variance Explained, and Canonical Correlation

Function	*Eigenvalue*	*Percent Variance Explained*	*Canonical Correlation*	*Wilks' Lambda*
1	6.53	96%	.93	.10***
2	.28	4%	.46	.78***

*p < .05. **p < .01. ***p < .001.

Table 8

Discriminant Function Analysis, Standardized Canonical Discriminant Function Coefficients

*O*NET Items*	*Function 1*	*Function 2*
Wear Common Protective or Safety Equipment such as Safety Shoes, Glasses, Gloves, Hearing Protection, Hard Hats, or Life Jackets	.50	.38
Exposed to Hazardous Equipment	.30	-.64
Handling and Moving Objects	.15	.25
Operating Vehicles, Mechanized Devices, or Equipment	.41	-.49
Exposed to Hazardous Conditions	.08	.03
Performing General Physical Activities	.37	.50

Table 9

Multiple Regression Test for Mediation

	b	$SE\ b$	β	ΔR^2
Step 1				.03*
Constant	5.04	.08		
Occupational Risk	.07	.03	.17*	
Step 2				.04
Constant	4.81	.18		
Occupational Risk	.06	.04	.14*	
Perceived Risk	.104	.07	.10	

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

Table 10

Moderated Mediation Analysis

	b	*SE b*	*t*
Mediator Model			
Constant	-.01	.08	-.09
Occupational Risk	.30	.08	3.81***
Masculinity	.03	.08	.34
Occupational Risk X Masculinity	.05	.09	.55
Dependent Model			
Constant	-.03	.08	-.44
Occupational Risk	.09	.08	1.13
Masculinity	-.17	.08	-2.10*
Occupational Risk X Masculinity	-.16	.08	-1.76*
Perceived Risk	.13	.08	1.59
Perceived Risk X Masculinity	.15	.08	1.99*

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

Table 11

Conditional Indirect Effects at Specific Values of Masculinity

Masculinity Coefficient	*Indirect Effect*	*SE b*	*Z*
-1.00	-.00	.03	-.08
0.00	.04	.02	1.45
1.00	.09	.05	1.90*

*p < .05. **p < .01. ***p < .001.

Figure 1. Safety motivation as a function of occupational and perceived risk and influenced by masculinity.

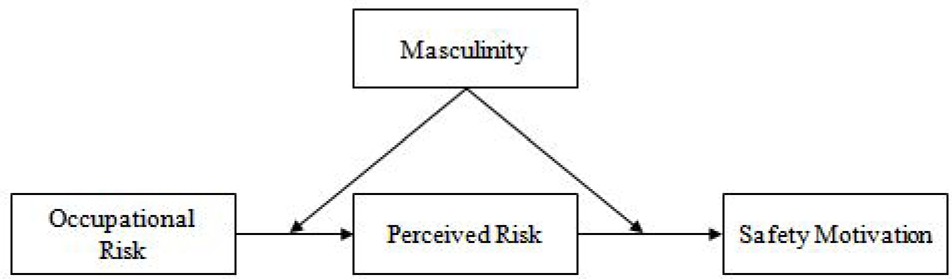

Figure 2. Masculinity moderating the relationship between perceived risk and safety motivation.

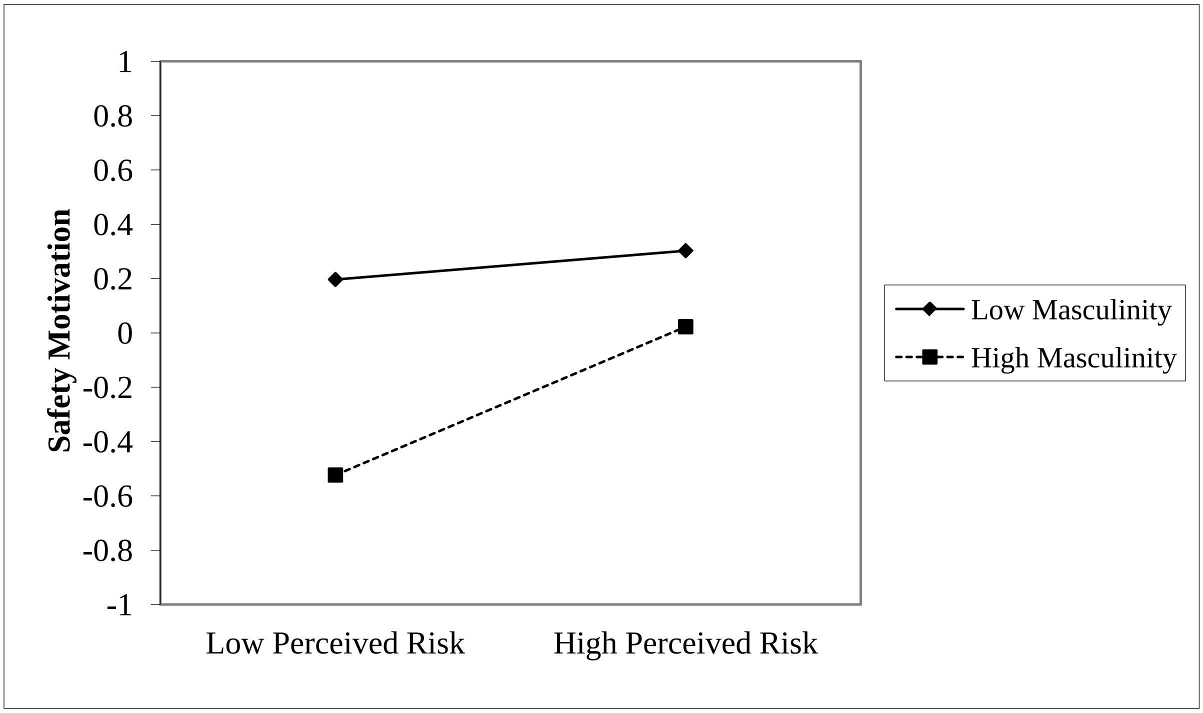

Figure 3. Masculinity moderating the relationship between occupational risk and safety motivation.