(EN)GENDERING SAFETY:
MASCULINITY, RISK, AND SAFETY SOCIAL CAPITAL
IN MALE DOMINATED OCCUPATIONS

by

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Abstract

High hazard work sectors are often male-dominated, and can have occupational cultures that impede following safety regulations. Many of these sectors, such as the skilled trades, have cultures that align with conventional masculine norms. The existing literature suggests that workers in these fields often experience safety compliance measures as conflicting with this normative culture, and this can lead to increased risk taking. It has also been found that organizational attitudes towards safety in the workplace individualize these issues, rather than considering a widespread lack of compliance as a symptom of underlying social issues. This research project used a case study approach to evaluate risk taking and organizational approaches to safety at the male-dominated organization, WestTech. Using both quantitative and qualitative accident reports, I found that risk taking and accidents vary by occupational sector; however, this was not addressed in WestTech's conclusions or safety recommendations. The relatively new accident investigation model, "Curtailing Accidents by Managing Social Capital" (CAMSoc), is discussed and employed to evaluate how the inclusion of social factors can help to better scrutinize the role of these underlying issues and how they contribute to negative safety outcomes.

Preface

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Dedication

To my dad…and anyone who has thought better than to be daunted by seemingly insurmountable obstacles.

1 INTRODUCTION

Male dominated, hazardous occupations often have organizational cultures that provide social and monetary benefits to those who adhere to the conventional male gender role (Paap, 2006). Men in male-dominated sectors continue to sustain the majority of occupational injuries and fatalities in Canada (ILO Laborsa Occupational Injury Statistics, 2010). The conventional male gender role includes displays of risk-taking, physicality, self-reliance, self assurance, and autonomy: all of which can conflict with complying with occupational health and safety policies (Mullen, 2004; Messing et. al, 2004; Courtney, 2000; Ely & Meyerson, 2010). Previous work that has examined the impact of gender on occupational health and safety has suggested that male-dominated industries, such as construction or the skilled trades, must include gender in the analysis of workplace safety (Mullen, 2004; Messing et. al, 2004; Courtney, 2000; Ely & Meyerson, 2010). Much of the existing research has focused on individual worker's experiences, without examination of how gender can influence the broader organizational culture, or considering how organizations can create more effective and sustainable safety cultures in similar sectors. This research project examines how risk-taking and severity of outcomes vary based on occupational group, and investigates the organizational response and interpretation of the findings of in-depth accident analyses.

1.1 Approaches to Managing Occupational Health & Safety

Approaches to managing occupational health and safety can be divided into two broad categories: 1) those that use behaviour-based safety (BBS) management and 2) those that focus on organizational culture. These approaches are usually employed in a mutually exclusive way, and are often thought of as opposing philosophies. Behaviour-based interventions borrow heavily from psychology, and employ methods such as operant conditioning and behavioural modification (Geller, 2001). Organizational approaches to safety are informed by management and sociological theory. DeJoy argues that BBS and organizational theories are best employed as complementary, rather than oppositional practices, and that a more thorough integration of the two would lead to better occupational safety management.

The basic mechanism of BBS management is behavior modification. Interventions focus on correcting unsafe behaviour by using behaviour-modification techniques, such as operant conditioning, at the worker-level. Evaluation of unsafe work practices identifies behaviours as key sites of intervention, and once these behaviours are identified, safe and unsafe behaviours are respectively reinforced or discouraged, by the employer. Employees are observed, interventions are targeted to specific actions, goals are set to assess progress, and feedback is continually provided (Geller, 2001; 2005). If a construction worker does not wear safety goggles, a BBS technique would seek to modify this behaviour by providing positive reinforcement when the goggles are worn, or some form of punishment when they are not worn[1]. Because BBS provides empirical and objective goals, it has resulted in compelling and concrete evidence of increased compliance with safety regulations. Despite this evidence, there are also critiques. Because BBS relies on the identification of specific, unsafe practices, it is usually an idiographic intervention, which cannot often be globally applied. Additionally, because the responsibility of safety is placed squarely on the shoulders of the workers (Howe, 2001), it can result in little attention paid to macro level causes and organizational culpability for unsafe work practices. Rather than treating the cause of the problem, which is often the organizational culture itself, BBS aims to treat the symptoms, which requires ongoing reinforcement to create lasting effects. Unsafe behaviour at the worker level, is best thought of as the "last link in a causal chain", and focusing solely on the outcome does little to address underlying factors that contribute to initial causes of unsafe working conditions and behaviours (DeJoy, 2005).

Organizational or cultural approaches to safety focus on the cultural elements that influence safety behaviour. Organizational culture influences the individuals within it, passing down institutional values, beliefs, and mores (DeJoy, 2005). The values, beliefs, and mores towards safety within work organizations undoubtedly affect how safety policies are considered and implemented, as they are received and internalized by the worker. This becomes especially important in high-risk work contexts. Whereas behavior-based management techniques are best described as treating the symptoms of an unsafe work culture, cultural interventions are best described as treating the underlying causes. BBS techniques

[1] For a more thorough review of operant conditioning principles in organizational contexts, see Jablonsky & DeVries, 1972.

are generally “bottom up”, focusing on the individual actions of workers, whereas cultural interventions are best thought of as “top down”, focusing on changing the underlying beliefs and values of the organization, with the ultimate aim of having these new principles internalized by workers (DeJoy, 2005). Here, interventions are done at the management level, and are largely qualitative in nature, relying on interviews and questionnaires. Assessments are made of the overall safety culture, and both short and long-term goals are set. Factors such as the availability of safety training or adequate equipment serve as indicators and symbols of how seriously safety is considered (DeJoy, 2005). Counter to BBS techniques, which involve tangible and empirical assessments based on objective criteria, organizational approaches are not as concrete. Whereas BBS management techniques rely on the observation of workers to implement change, the organizational equivalent for the unit of analysis is more elusive. Organizational approaches require methods that assess values and beliefs, which are often difficult to operationalize. Inferences must be drawn from current policies, implementation strategies, and investigative procedures to get at the values and beliefs that underpin the culture. However, despite the inherent measurement issues, organizational influences on safety have been found to account for a substantial portion of the variance in the safety climate of organizations, even when controlling for more concrete, safety-relevant variables (DeJoy et al., 2004). As with BBS techniques, these interventions are idiographic, requiring in-depth analyses of the culture of specific organizations. Due to many factors, including inertial forces, organizational cultures are inherently difficult to change (Hannan & Freeman, 1984), and these interventions can be lengthy as well as costly (DeJoy, 2005).

1.2 The Call for an Integrative Approach to Organizational Safety

Despite the apparent differences between these approaches, they do share common ground. Both seek to have safety in organizations viewed as an ongoing process, rather than something that can be remedied with a silver bullet, and both require employee involvement and a consideration of the organizational culture to differing degrees (DeJoy, 2005). BBS approaches acknowledge the importance of organizational culture, as BBS modifications must fit within a given context: if an intervention is not well received on a worksite, it will not be effective (Krause, 1997). Further to this, Saari argues that because BBS programs involve employees in the process of improving safety, this ultimately contributes to a safer organizational culture, as a body of workers who are invested in safety can create broader, on the ground cultural shifts in attitudes towards safety (1992). Similarly, organizational approaches recognize the importance of positive reinforcement of successful outcomes to reinforce safety behaviour at the worker level. Because of these underlying compatibilities, BBS and organizational approaches are more compatible than they seem. When both strategies are employed, they bolster each other's weaknesses by drawing on the other's strengths. It is for this reason that DeJoy suggests they be used in tandem, which he calls the integrative approach (2005).

1.3 Theory into Practice – What Does an Integrative Approach to Safety Look Like?

Without engaging workers in organizational approaches to safety, interventions can be experienced as bureaucratic processes, removed from the realities of the embodied work. Echoing DeJoy's call for an integrative approach, Antonsen and colleagues suggest the key to creating lasting change is through meaningful interaction regarding safety issues between management and workers (2007). In order for safety policy to be effective, it must be accepted, and ideally internalized, by workers. Organizational approaches to safety that rely too heavily on rules and regulations, amount to a one-way process, which stagnates the effectiveness of safety policy. This top-down approach shuts out worker's experiences and practical knowledge. It also alienates workers from management, which can lead to decreased trust and commitment in and to policy (Barling & Hutchinson, 2000). Opening avenues for workers to contribute their perspectives on safety allows for workers to share their relevant experience and ideas, which fosters a sense of involvement, responsibility, and can ultimately inform more effective policy with new and innovative ideas (Antonsen et al., 2007). Worker participation in safety policy formation creates more meaningful policies, and also improves employees' commitment to safety and trust in management.

Antonsen and his colleagues argue that research on safety culture fails to consider that issues of power and conflict affect relationships and adaptation of policy within work settings (2009). Workers are socialized by cultural norms external to the organization: socialization processes with regard to issues such as class and gender, inevitably influence how individuals interact within a work context. Organizational osmosis refers to the adoption of the culture, values, and ideas of an organization, which is largely dependent on anticipatory socialization prior to entering the organization (Gibson & Papa, 2000). A worker enters into an organization not as a blank slate, but as a preemptively socialized individual, who holds values and beliefs that are either congruent or incongruent to those of an organization. Antonsen argues that the representation of safety cultural theory as apolitical and devoid of power and conflict is an idealistic and contrived representation: external socialization introduces power struggles and conflict that can play out within organizations, and must be acknowledged in order to better tailor policy to the worker population (2009). Because of this, it is important to consider how this external culture can either inhibit or facilitate organizational osmosis, and how safety policies can be best fitted to the prevalent culture of its workers. Without the acknowledgement that culture and power are intertwined issues, and understanding how these dynamics can affect safety outcomes, policy may be ineffective (Antonsen, 2009).

1.4 An Integrative Approach to Managing Safety: Safety Social Capital

In the pursuit of integrating BBS and cultural strategies, it is helpful to consider the role of, what Rao calls, safety social capital (2007). The definition of social capital varies (Portes, 1998), but Rao draws on both Putnam's and Coleman's conceptualizations. Putnam defines social capital as being "the collective value of all social networks and the inclinations that arise from these networks to do things for each other….and consists of the features of social organizations such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit". Coleman defines social capital in terms of its function: that being, any social resource that facilitates action (collective or individual), and is engendered by social norms, social networks, trust, and reciprocity (Coleman, 1990; Portes, 1998).

Rao draws on these definitions, and builds on them to define safety social capital as the collective values that exist and are embodied within the networks in an organization and its workers towards safety. By naming safety social capital as such, it allows for these values, norms, and networks to be recognized, managed, and developed in an organization to work towards a safer environment. This can be done through formal avenues, such as through corporate expectations, regulations, and policies, and also informally, by focusing more attention on the relationships and networks of workers (2007). Rao posits that safety social capital resides within, and is generated by, all social networks in an organization. These networks can be formally created through organizational classifications (such as a job title, or belonging to the same union) and informally fostered, through friendships or a sense of camaraderie amongst workers. It is within these networks where safety social capital can be generated, perpetuated, and acted upon.

By naming safety social capital, it becomes feasible to manage it: Rao suggests that organizations should use accidents as a means of investigating how safety social capital operates, and how it facilitates or obstructs safe behaviours. Rao's prescribed methodology for managing safety social capital relies on a framework grounded in sociological and management theory. The site from which to manage social capital, and to facilitate broad organizational cultural change is through the relationships of employees and employee groups. Further to this, organizational features that foster coordination and cooperation between workers and other groups must be identified and strategized around to bolster safer work outcomes. In order for an organization to begin to develop this management of safety social capital, first, it must identify the existing norms, values, and social dynamics that can contribute to unsafe work conditions and practices.

Although many accident analysis techniques over the last twenty years have focused on human factors (For examples see: Shappell & Wiegmann, 2001; Rearson, 1995; Rasmussen, 1997; Leveson, 2004), these models have evaluated organizational influences on behaviour or focus on individual behaviours without regard for contextual factors. The difficulty in managing safety behaviour within organizations stems from the complexity of human behaviour and factors that influence this behaviour. People's actions and responses to a situation can vary depending on the context; for instance, time pressures or social dynamics in a work crew will affect how an individual or a group preforms the work (Rao, 2007). Actions are neither determined wholly by organizational influences, nor are they wholly removed from it: they are embedded within cultural contexts (Granovetter, 1985). Additionally, although safety norms are formalized through written policies, training, and organizational requirements, the informal process of the internalization of these norms is necessary to cultivate a self-sustaining safety culture. A large proportion of workers must buy into the efficacy and legitimacy of these policies in order to facilitate the collective behaviour and thinking that will result in the actual practice of them. Because of this, it is important to consider the complexity of the social dynamics and the importance of relationships when evaluating safety incidents.

A fertile source from which to evaluate the role of safety social capital in an organization is by analyzing the role of social actors and the social dynamics between these actors in occupational safety incidents. Rao has outlined a model to evaluate safety social capital from accident investigations, called the "Curtailing accidents by managing social capital" model (CAMSoc). The ultimate goal of this model is to "systematically extract social lessons learned from accidents…which in turn can be utilized by organizations and regulators…[to advance] towards a better safety culture" (734). CAMSoc accident investigations include an examination of the social actors and social dynamics that frame all aspects of an incident, in order to reveal "underlying, [dysfunctional] organizational socio-features [with regards to] networks, norms, and trust". This is ultimately meant to answer, "how and why organizational safety social capital is eroded", and by doing so, lead towards solutions for these underlying issues. The framework for analysis should include both sociological and management principles to the accident analysis. The technological deficiencies that led to the incident, as well as an analysis of the social factors and actors involved, the relationships among them, and a critical investigation of the reasons for any deviant behaviour that led to an incident are all considered relevant to the analysis (Rao: 734). Individual behaviours are assessed as stemming from various sources: 1) primarily internal causes, such as one's own motives or traits, 2) external causes, such as an aspect of the social or physical environment, or a combination of both. This analysis should lead to an identification of the social motivators and the organizational factors that contributed to an accident. These conclusions will help identify which elements broke down, and will inform the strategies for managine safety social capital that could prevent similar conditions in the future. Methods of evaluation in the model include the review of primary accident investigation reports and databases, and when possible, interviews with the parties involved. Whether they are human or technical in nature, once the causal factors are identified, the social context is then examined and "social factors" are identified which underpin the observed cause or causes. This type of investigation should be used to identify underlying social factors that contributed to an incident, allowing for more effective organizational management of safety social capital. The CAMSoc method is a relatively recent model, with little empirical or theoretical work yet conducted; however, studies that have considered these issues have suggested that social capital and social networks are important contributors to the overall occupational safety climate, and should be further studied and empirically evaluated (Bigelow, 2010; Zohar and Tenne-Gazit, 2008).

The inclusion of social factors in accident analysis is an important improvement to the investigative process; however, the idea of safety social capital being insular in nature and solely influenced though organizational networks is, as Antonsen and colleagues argue, idealistic (2009). Different sources of socialization inevitably affect how workers behave, and different sources of cultural capital transgress organizational barriers, and ultimately affect how social capital operates within the networks in organizations. Because networks, norms, and trust depend on shared cultural capital, organizational evaluations of how to manage safety social capital must assess dominant cultural ideologies and the norms and values that exist within a workforce.

Different aspects of identity become more or less salient depending on the work environment, and the saliency of a given feature will influence the broader culture of an organization. The sex composition of an organization and the culturally based gendered expectations of the work roles factor into the gendering (or lack thereof) of a work culture (Ridgeway, 2009; Ely & Meyerson, 2010). In high risk, male-dominated sectors, this is an important consideration. Because many high-risk jobs are synonymous with conventional masculine expectations (Ely & Meyerson, 2010), and because gendered hierarchies are rife with power and conflict (Connell, 2005), gender becomes an important feature within social relations and safety social capital in these sectors. It is not sufficient to examine internal, meaning solely organizational influences, on safety social capital. Investigations must consider external cultural influences and how these play out internally through the social dynamics between workers in an organization. These factors affect the organizational culture and this will ultimately affect how safety social capital is both strengthened and eroded.

1.5 (En)Gendering Safety: The Case for the Inclusion of Gender in OSH Policy & Practice

Strategies that seek to change safety behaviour and culture in organizations can often be limited by considering only a narrow range of factors. The issues discussed above involve broad themes of power and social dynamics between workers, and the importance of their inclusion when considering the effectiveness of safety policy. Because the context of work determines which aspects of identity become relevant (Ridgeway, 2009), and in turn which forms of cultural capital are privileged in that context, male-dominated work offers an interesting site from which to mobilize these theories.

Over the past 20 years there has been a growing body of research pointing to the role that gender plays in safety behavior and compliance within the workplace (Mullen, 2004; Messing et al., 2003, Iaucone, 2005; Courtenay, 2000; Messing et al., 1994). It has been found that men are more prone to occupational injuries and fatalities (Hersh, 1998) and are more likely to engage in risky behavior within the workplace (Mullen, 2004). Given this, high hazard work sectors, which are male-dominated, are especially important to study. Gendered constraints on safety behaviour, and their effect on safety social capital must be adequately considered in these environments, in order to better tailor occupational safety initiatives.

If a work organization, intentionally or otherwise, cultivates masculine norms as a central component of its culture, behaviour that goes against key aspects of that role can be seen as deviant. It is important to recognize how this cultural dynamic can influence adherence to safety policies. There are many motivations for not following safety regulations, however, male-dominated workplaces have the particular challenge of grappling with employees who might experience safety compliance as conflicting with a masculine self-image (Ray et al., 1997). If this permeates the culture of an organization, this can lead the normalization and reinforcement of behaviour that is inherently unsafe.

Drawing on West and Zimmerman's work of "doing" gender (1987), gender can be understood as a social *process,* which is maintained and reproduced through interactions and individual behaviour. Although there are many constructions of masculinities, Connell's work on hegemonic masculinity (1995) is central to the type of masculinity that is present within many risky, male-dominated work sectors. Hegemonic masculinity is the culturally normative ideal of male behaviour: it takes different forms, though it is always the construction that garners and reinforces the most power within a given context. Ely and Meyerson contend that organizations are important sites of gender performance, where conventional gender ideologies are recreated (2010). Organizations draw on cultural norms, and in occupations that are typically associated with a particular sex, the skills for these occupations tend to become synonymous with those attributes that are conceived of as "masculine" or "feminine". They argue this is only further entrenched by the prevalence of men (or women) in a particular occupational field, lending credibility to the appropriateness of the norm of male or female dominated sectors. Work becomes not just paid labour, but also a ground for rehearsing and proving gendered identities (Ely & Meyerson, 2010). Jobs that are male dominated and reinforce hegemonic norms of masculinity become interesting sites from which to analyze the effects of this culture on safety social capital.

Norms associated with conventional masculinity can conflict with the actions and behaviours that are required to comply with occupational safety regulation. Behaviours like purposive risk-taking and strict self- reliance, which have been identified as being central to conventional masculinity (Mahalik et al., 2003), are not only detrimental to safety compliance, but also directly opposed to it. Examples that illustrate how these norms can manifest within safety behaviour are numerous. Prior work has shown that male workers are more willing to take risks and do unsafe work if it will reinforce a masculine image. Mullen identified key themes, which prompted unsafe work behaviours in men in male-dominated settings, including a fear of ridicule and the need to appear competent. Some male workers were found to seek out situations in which they could take greater risks or do unsafe work as a means of enhancing their image as courageous, self-reliant, and capable (2004). Men within culturally defined male-typed sectors, such as construction, have been found to avoid wearing safety equipment and to not perform safety protocols for fear of losing respect from their peers for appearing fearful, and have been found to purposely take risks and encourage other workers to do so as a way of displaying self-assurance (Mullen, 2004; Choudhry and Fang, 2008). Research on other male dominated occupations, such as police forces, has found a "hidden curriculum" evident in training programs, cultivating conventional masculine norms (Prokos & Padavic, 2002). Such climates have been found to lead those who do not adhere to these norms to overcompensate by taking risks to prove competency (Goldenhar et al., 1998). Other studies have found that many sectors have cultures that marginalize workers who do not conform to masculine expectations. In these contexts, marginalized groups serve as a reinforcement of a hierarchal gender structure and unwittingly provide a "foil" for the dominant masculine culture, allowing for categorization of those who "belong" and those who do not (Prokas & Padovic, 2002). This categorization of in and out groups arguably creates differential access to organizational networks, norms, and trust, and has the potential to erode safety social capital. Masculinity, in this light, becomes an integral component in exercising safety social capital in a culturally defined male gendered workforce. If the dominant culture within a workplace values displays of competency, which are founded on conventional norms of masculinity, workers can gain respect by acting in ways that comply with these norms. Despite the existing research, which suggests the importance of analyzing the role of gender within the workplace, little research has yet to focus on how this interacts with processes of safety socialization (Mullen, 2004).

Organizations that are culturally defined as male oriented often privilege manifestations of what is considered appropriate displays of masculinity. This masculinity is often displayed by way of exercising authority (power over), independence, individualism, and self-reliance and assurance (Messerschmidt, 1996; Connell, 1995). These behaviours are linked to occupational safety, because policies that call for compliance to top-down rules, reliance on others, or necessitating checks (and thereby introducing doubt) of one's actions, can be experienced as direct threats to autonomy, competency, and other elements that are experienced as central to conventional masculine norms. In this way, safety procedures may be ignored or purposefully acted out by individuals as a way of asserting masculinity. Kimmel argues that masculinity is "a homosocial enactment", where male peer groups act to develop and affirm each other's gendered identity (1996). It follows that these displays within a male-dominated work setting, where masculinity is seen as central to the impression of competency, and the allocation of respect, creates a culture that is dependent on the continuation and valorization of these, in the context of safety, deviant behaviours.

Conceptualizing gender as a process within work environments leads to an examination how the conventional masculine norms and values within and outside of the work role becomes a central component of a worker's self-concept. In her ethnographic study of male-dominated, skilled trades, Paap found that those who hold status within an organization set the cultural values: in male dominated work that is culturally defined as male-typed (such as skilled trades), organizational cultural values often become synonymous with conventional masculine values (2006: 51). She elaborates on this, and argues that, "workers [who meet] the preconceived ideal of [a tradesperson] …or fit the cultural…and contextual definition of the insider" were granted more status within the organization. She found that in this setting, norms and values that were championed and granted status were demonstrations of individualism, competitiveness, and a disregard for risk, injury and pain (2006: 51). In sum, larger cultural definitions of what attributes an ideal man embodies became the basis of the evaluation of an ideal worker (Acker, 1990; Williams, 2001). These observations fit with other work, which has found similar values in work that is culturally defined as male-typed (see Choudhry & Fang, 2008; Mullen, 2004; Prokas & Padovic, 2002; Goldenhar et al., 1998; Messerschmidt, 1996 for examples).

If the culture and values in an organization expects or privileges workers who conform to hegemonic masculine norms, and masculinity is reinforced through displays of authority, risk-taking, self-reliance, or self-assurance within work settings, this inevitably effects how safety regulations will be interpreted and acted out (or against). Because these norms often impede safe work practices, workers in high hazard, and male dominated sectors are conceivably less likely to follow safety regulations, and more likely to engage in risk. To better tailor policy initiatives to an organization, occupational health and safety policy makers must begin to understand the role of masculinity within the culture of male dominated work, and in turn, how this affects safety outcomes.

To evaluate these issues, this research project uses a case study approach to look at how masculine norms and social dynamics affect safety outcomes, and how these social factors could be included in the analysis of accident investigations. It is argued that by including these elements, and recognizing the cultural influences on individual behaviour, underlying social factors within work settings can be evaluated and can be used to more effectively manage the safety social capital in organizations. The occupations included in the analysis are skilled trades, which are male-dominated and male- typed, being culturally defined as “men’s work” (Paap, 2006). Risk-taking behaviour in reported accidents is used as an indicator of conforming to conventional masculine norms. Social factors in internal, in-depth accident analyses are evaluated to assess whether these circumstances could have conceivably contributed to the accident outcomes. Recommendations are made both for policy and future research directions.

2 METHODS

2.1 Data

Research was carried out in cooperation with WestTech, an organization based in Western Canada with a workforce of over 5,000 employees. The aim was to explore conventional masculine norms and safety social capital within safety incidents, and how and if these were considered in the analyses of accidents. Both qualitative and quantitative data were used. In order to evaluate what factors are included in the analysis of accidents, seven internal investigative reports were evaluated. WestTech carries out internal investigations of serious safety incidents, to assess probable causal factors, as well as to identify solutions. Ten years of incident reports from WestTech's reported accident database were used to assess the prevalence of a risk-taking culture, and how this varied primarily by occupation. Each reported accident included the demographic information of the injured worker, including sex, age, occupation, the classification of the severity of the incident, and a qualitative description of the event that preceded the incident.

The selection criteria for included occupations for analysis were 1) whether an occupation was culturally defined as male-typed work (e.g.: skilled trades), and 2) if the work performed was inherently dangerous (e.g.: working with high voltage equipment). Three occupations met each of these criteria: Power Line Technicians (PLTs), Cable Splicers, and Electricians. This resulted in the inclusion of 798 cases chosen for analysis.

WestTech has a largely unionized workforce[2], with an apparent corporate dedication to safety. They hold regular departmental safety meetings, frequent initiatives for worker safety training, and have a large safety and health department which oversees, analyzes, and implements safety policies, procedures, and accident investigations. In addition to legal requirements to report workplace injuries, workers are encouraged (at the very least by corporate-level management) to report all safety incidents and "near misses[3]", which allows these incidents to be analyzed by WestTech's Health and Safety department to identify key sites for intervention. From the period of 2002 to 2012, there were 1,715 total reported accidents, representing 184 occupations.

Working within the context of a company that is ostensibly dedicated to occupational safety, with a primarily unionized workforce, provides excellent controls for corporate ambivalence towards occupational safety, which is often seen as a confounding factor in non-compliance behaviour (Neal et al., 2000). However, despite their corporate initiatives to oversee worker safety and internal reviews of safety incidents, over the past ten years, WestTech has had, on average 169 health and safety incidents reported every year, and one serious safety incident or fatality every six months.

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[2] WestTech employs non-unionized workers through contracts, though the majority, and the population from which these data are gathered, is unionized.
[3] A near miss refers to an incident that had the potential to result in an injury or fatality, but ultimately did not.

2.2 Dependent Variables

Severity of Outcome

Severity of an accident outcome was used as an outcome, an objective measure of level of risk that was taken. Severity was coded on a four point scale based on whether the injury required first aid (1), medical aid (2), or resulted time off work (3), or a fatality (4). The severity category was also collapsed into a dummy variable, differentiating minor injuries that only required first aid (0), from more serious injuries that required more than first aid (1). Severity of an accident was used as an indicator of level of risk taken, based on the assumption that taking greater risks is likely to result in a more serious accident.

Level of Risk Taken

The level of risk taken was measured by coding the qualitative description of each accident based on set criteria. Risk taking was defined as any violation of safety regulation, and the level of risk taken was measured by evaluating the potential consequences of the actions that a worker engaged in. This was coded on a one to four scale, and also included in a composite measure. If a worker followed all safety regulations, the incident was coded as an accident (1). The outcome of an accident coded at this level could conceivably be fatal, but the worker would not be at fault: for instance if the worker was a passenger in a fatal car accident. If a worker violated a safety regulation, the potential consequence of that action was assessed in relation to the work being done, and assigned a level of risk. Minor risk (2) was coded if the likely consequence of the action was non-life threatening, most likely only requiring first aid intervention. An example of this would be a worker who was using a sanding machine but did not wear protective gloves, which could result in a skin abrasion. Major risk (3) was coded if the likely consequence of the action was non-life threatening, but would likely require medical intervention, and could possibly interrupt work or life duties. An example of this would be if a worker was grinding down metal on a machine without wearing protective eye goggles. Severe risk (4) was coded if the likely consequence of the action was life threatening or a debilitating injury, and would likely interrupt work or life duties. If a worker failed to follow proper procedure when working on high-voltage equipment, which could result in electrocution, this would be classified as a severe risk.

Table 1. Risk-Severity Composite - Coding Scheme

Level of Risk	**Possible consequence**	Example of Incident
1 – No rule violation/No deliberate risk Taken	N/A	Involved in car accident as a passenger.
2 – Minor risk taken	Non-life threatening; first aid intervention likely	Using sanding machine without appropriate gloves
3 – Major risk taken	Non-life threatening; medical aid intervention likely	Not wearing eye protection while grinding metal.
4 – Severe risk taken	Life threatening	Worker falls from 20', not wearing proper fall-arrest equipment.; worker fails to follow protocol while working on high voltage equipment.

The risk category was also collapsed into a dummy variable. The dummy variable indicated if no rule was violated, and therefore no risk was taken (0), or if a rule was violated, and therefore some level of risk was taken (1).

Using severity of an outcome can be a poor indicator of risk, since not all risks taken manifest in the potential consequence, and conversely, the severity of the consequence is not necessarily an accurate indicator of level of risk that was taken. An example of this is if a worker cuts his hand while working on a power line. This accident would normally be classified as minor, if it resulted in nothing more than a superficial wound. Imagine, however, that the line the worker was fixing was atop a 30-foot power pole, and he wasn't wearing a safety harness. Although the outcome of the incident resulted in a minor injury, the incident description, which includes the context of the injury (not wearing fall arrest protection), allows for an assessment of the level of risk the worker engaged in. In this example, the worker did not fall from a dangerous height, but did take a risk by not wearing fall-arrest protection equipment, violating a safety regulation, which could have resulted in a more serious injury. Both violation of rules (acting autonomously) and engaging in risk are used as indicators of engaging in behaviour that is culturally defined as masculine (Messerschmidt, 1996; Mullen, 2004). Each accident report included a description of the events preceding the incident, and these descriptions are conceivably more valuable than standard measurements of injury outcomes, because they provide insight into behaviours that might not otherwise be known or measured, and therefore, can be a more accurate predictor of level of risk that a worker engages in. Although not all incident descriptors involve this detail of context, almost all provide richer contextual information than the severity of the outcome alone.

A Risk- Severity Composite scale was created, amalgamating both the severity of an outcome and risk scale indicators, resulting in a 2 to 8 scale.   The mean was 3.58. The relationship between the risk measure and severity measure was assessed, which showed a fairly weak positive correlation between the two variables, $r = .119$, $p < .001$. The composite measure allows for different indicators of risk taking to be measured, which enhances the reliability and validity of the measurement. The Risk-Severity Composite was also collapsed into a dummy variable, which indicated whether incidents were accidental and minor in consequence (0), or whether the violation, risk, and consequence were more severe (1).

2.3 Independent Variables

Occupational Groups

Three occupational groups were included in the analysis of variance of risk: Electricians, Cable Splicers, and Power Line Technicians. Of the 798 cases included, 183 were Electricians, 23 were Cable Splicers, and 593 were PLTs. Dummy variables were constructed for each of the occupational groups. Electricians were used as the referent group. The selection criterion of included occupations was whether an occupation was culturally defined as male-typed work (e.g.: skilled trades), and if the work performed was inherently dangerous (e.g.: working with high voltage equipment). The diversity of occupations at WestTech meant that including all occupations would result in inequitable comparisons across sectors. For example, the risk that is inherent in a PLTs job (who work at heights in excess of 40 feet and on high-voltage power lines) is not comparable to the risk that is inherent in an engineers' job, which generally takes place in office settings. Because the potential severity of an outcome is used as an indicator of the level of risk that is taken, it makes little conceptual sense to compare occupational groups that do not have similar inherent risks in the nature of the work they do.

Electricians at WestTech are required to install, test, operate, maintain, and repair high voltage electrical equipment, work at substations[4], climb to varying heights, work in confined spaces, and handle heavy equipment. Cable Splicers are required to splice, test, and repair cable which carries both high and lower voltage electricity, climb to varying heights, work outside, work in confined spaces, and handle heavy equipment. PLTs are required to repair and maintain power line poles, towers, and underground cable systems, climb to varying heights, work outside, and handle heavy equipment. The training for each of these professions is comparable, requiring a minimum of high school education, with an additional four-year apprenticeship program for Electricians and Power Line Technicians, and three and a half years for Cable Splicers. In addition, the same union represents all of these occupations at WestTech. Although different in terms of actual duties, these three occupations are comparable in that they expose workers to similar levels and kinds of risk.

Experience

Seniority of a position was used to measure job-specific experience. This was measured using the sub-classification of each occupation: apprentice, journeyperson, or foreperson. Of the 798 cases included, 102 were apprentices, 556 were Journeypersons, and 141 were Forepersons. Journeypersons were used as the referent group. Dummy variables were constructed for each sub-classification group. Apprentices are workers with less than four years of experience, and have

[4] Substations house high voltage electrical equipment which reduce high voltage electricity to a level that is suitable to supply to consumers.

not yet received full certification. A Journeyperson has received full certification, and Forepersons and Sub-Forepersons[5] have received full certification and are in charge of work crews. Both too little experience and extensive experience are thought to increase risk-taking behaviours for different reasons. Minimal experience is thought to increase risk-taking, likely due to lack of knowledge, and extensive experience is thought to increase risk-taking because senior workers have been found to become complacent (e.g.: Westaby & Lowe, 2005).

Age

Age of the worker involved in each incident was included in the analysis. The range was 20 to 72, with a mean age of 44. The average age of Cable Splicers was 46, for Electricians it was 44, and for PLTs, it was 40. Young age, especially with men, is often positively correlated with risk-taking (Nicholson et al., 2005; Turner & McCLure, 2003).

Year

All data included was from a ten-year span, from 2002 to 2012. 2002 was used as the referent group. A dummy variable for each year of data was created to account for any changes in the independent variables over time.

Analysis

The Risk-Severity Composite was analyzed using OLS regression. However, the distribution of the Risk-Severity scale did not have a normal distribution, and was positively skewed. Logistic regression was used to assess whether this skewed distribution altered the substantive findings of the results. This was done using the

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[5]Forepersons and Sub-Forepersons were collapsed into the same category because conceptually, their level of experience did not vary.

collapsed Risk-Severity binary outcome. The level of measurement of the Risk-Severity composite is arguably a nominal or ordinal, rather than an interval scale. This composite was separated and collapsed into two dummy variables: a binary measure of risk and a separate binary measure of severity of outcomes, in order to allow for an arguably more appropriate statistical analysis, given the level of measurement. These binary measures of risk and severity were analyzed separately using logistic regression.

2.4 Limitations

One of the major limitations of this research is that there were too few female workers represented in the accidents to include in the analysis. Of the 798 accidents analyzed, just three involved women (.004%). The sex demographics of skilled trade workers in Canada is largely sex segregated, with a higher proportion of males employed within these sectors (Statistics Canada, 2011), and WestTech's skilled trade sectors differed little from the national statistics. Assuming that women do not adhere to similar conventional masculine norms in these settings, this limits the extent to which masculinity can be evaluated as a comparative factor in risk-taking.

2.5 Root Cause Reports and Accident Database

Rao's model for "Curtailing Accidents by Managing Social Capital" (CAMSoc) suggests that document analyses should be preformed on primary accident investigation reports and incident databases in order to assess the role of safety social capital and organizational influences on accidents (2007).

Management and administrators at WestTech, seeking to identify underlying conditions that contributed to serious safety incidents, carry out the root cause accident reports. Seven root cause accident reports were analyzed, stemming from incidents that occurred between 2003 and 2010. All but one of the reports was done using West-Tech's internal "Root Cause Analysis" technique, and the final case was done using an externally developed investigative tool. These reports attempt to answer what, why or how the circumstances that led to the incident prevailed. They include a detailed description of the incident, the circumstances which led up to the incident, and some demographic information of the members of the work crew involved. Each report concludes with recommendations that aim to prevent similar accidents in the future. The majority of the reports focused on the technical details of the accidents, discussing the equipment and the technical-human interactions that contributed to the outcome. Understanding the technical details of safety incidents provide important indicators of what went wrong, but they do not capture the social context that these actions were embedded within. This is important to note because, although the reports include details which point to social factors as possible contributing aspects of unsafe work environments, the investigations never hone in on these as possible "root causes" of the incidents. To highlight the issues relevant for this analysis, this research focuses on the social elements and contexts, and the descriptions and the technical details are simplified.

Seven in-depth "root cause analysis" reports from WestTech were evaluated. The evaluations looked for both what information was included as relevant to the findings, and for information on the social dynamics and interactions during each incident. A summary was created of the "who, what, why, and how" of each incident, according to the explicit details that were reported. Social dynamics and interactions were also included in this summary, regardless of whether they were identified by the investigators as contributing factors. Interactions and behaviours that potentially contributed to safety violations in each incident were categorized into seven types: defiance of authority, autonomous action, conflict, deliberate risk-taking, unintended risk, disregard of pre-incident warnings, and complacency of co-workers. If appropriate, a given interaction or behaviour would be coded using multiple types.   When readily available in the report, demographic information of workers involved in each incident was also noted, including details like sex and age. All occupations of those involved in the incidents were male-dominated, and were categorized as skilled trades.

Themes and patterns in the qualitative descriptions of safety events from the incident database were also evaluated. This field included contextual information of the circumstances surrounding the incident, and was used to code the level of risk for the quantitative analysis. Because WestTech has no standardized procedure for reporting qualitative accounts of accidents, it provided important insight into what types of information was presumed to be pertinent to the safety incident. They usually described worker's actions, noted the lack of proactive safety behaviour, and offered contextual details, which made it possible to assess the level of risk that worker's engaged in. These descriptions rarely contained information on the social dynamics between workers, which made a more thorough qualitative categorization of the interactions in these events impossible.

The evaluation of social dynamics was used to assess how they may have contributed to the normalization and perpetuation of unsafe work practices.

Because WestTech does not use a method similar to CAMSoc, which attempts to analyze the safety social capital in accident investigations, although social factors are included for descriptive purposes, they remain uninterrogated. This research sought to identify underlying social factors, including sources and indicators of safety social capital, and assess how these factors could have contributed to conditions where negative outcomes occurred.

3 RESULTS

The occupations included for analysis were all male-dominated: over the ten-year span under consideration, just 5.25% of Electricians and .002% of PLTs employed were women. There were no female Cable Splicers employed. Perhaps not surprisingly, the vast majority of workers involved in accidents were men: women accounted for just 0.4% of all incidents.

The occupational groups included in the analysis are all over represented in the accident database: something that could be expected, given the nature of the work. However, they are over-represented to differing degrees. Together, Electricians, Cable Splicers, and PLTs at WestTech made up just 12.9% of the total workforce, but accounted for almost half (46.6%) of all of the safety incidents and over 70% of all fatalities[6]. Electricians made up just 4.9% of the total workforce at WestTech, and accounted for 10.7% of reported accidents (2.2 times

[6] WestTech has had 27 fatalities over a period of 40 years: this figure refers to the history of fatalities, due to the relative infrequency which fatalities occur when compared to non-fatal incidents. From 2002 to 2012, there have been 7 fatalities at WestTech: 4 involving PLTs and 3 involving Electricians.

overrepresented in reported accidents). They scored, on average, lower on the Risk-Composite measure than the overall mean average of 3.58 (M = 3.29, SD = 1.296). PLTs made up 7.7% of the total workforce at WestTech and accounted for 34.6% of reported accidents (4.5 times overrepresented in reported accidents). They scored, on average, higher on the Risk-Composite measure than the overall mean (M = 3.64, SD = 1.293). Cable Splicers represented just 0.3% of the total workforce but accounted for 1.3% of all reported accidents (4.3 times overrepresented in reported accidents). They had the highest average Risk-Composite measure of the occupational groups (M = 4.14, SD = 1.699). All of the included occupational groups encounter similar exposure to dangerous circumstances, yet there is a discrepancy in the proportion of their overrepresentation and in their Risk-Composite scores. PLTs and Cable Splicers account for a far greater disproportion of accidents than Electricians, and score higher on the measurement of risk.

Table 2. Descriptive Statistics – Occupational Groups and Risk-Severity ; Risk ; Severity Measurements

Occupation	% of total workforce	% of accidents	n	Mean: Risk Severity	Mean: Risk Scale	Mean: Severity Scale
Electrician	4.9%	10.7%	183	3.29 (SD = 1.296)	1.37 (SD = .751)	1.92 (SD = .870)
PLT	7.7%	34.6%	593	3.64 (SD = 1.293)	1.65 (SD = .944)	1.99 (SD = .827)
Cable Splicer	0.3%	1.3%	22	4.14 (SD = 1.699)	2.05 (SD = 1.253)	2.04 (SD = .825)
Overall Combined	12.9%	46.6%	798	3.58 (SD = 1.316)	1.60 (SD = .923)	1.98 (SD = .837)

All of these sectors are male-dominated, and involve work that is culturally defined as conventionally masculine (i.e.: skilled trades). Based on the previous literature, workers in similar sectors have been found to be particularly vulnerable to engaging in behaviours that adhere to a conventional male role (i.e. risk-taking and expressions of autonomy, such as rule violations). Can the outcomes from these measurements offer any insight into the discrepancy in the rate of overrepresentation?

Table 3. Coefficients from the Regression of Risk-Severity Outcome on Occupational Group

Variables	Model 1	Model 2	Model 3	Model 4
Occupational Group				
PLT	**.355****	**.365*****	**.392*****	**.398*****
Cable Splicer	**.847***	**.848***	**.876****	**.898****
Age	-	.003	.005	.004
Experience				
Apprentice	-	-	.004	-.270
Foreperson	-	-	-.208	-.211
Year				
2003	-	-	-	.288
2004	-	-	-	**.443***
2005	-	-	-	**.369***
2006	-	-	-	.215
2007	-	-	-	.215
2008	-	-	-	.353
2009	-	-	-	.237
2010	-	-	-	.166
2011	-	-	-	.140
2012	-	-	-	.145
R^2	.018	.019	.022	0.033
R^2 Adjusted	.015	.015	.016	0.016

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

3.1 Risk-Severity Composite

In order to assess how risk taking and severity of outcomes varied by occupation, a multiple linear regression model was used, including controls for age, experience (including apprentice and foreperson classification), and for variations over the ten-year span (see Table 3). The results indicate that being a PLT increased the risk composite score by .398 (*p>.001)* and being a Cable Splicer increased the risk composite score by .898 (*p>.01)* when compared to Electricians. The results also indicate that overall risk-composite scores rose by .443 (*p>.05)* in 2004 and .369 *(p>.05)* in 2005 when compared to 2002. These results hold when controlling for age, experience, and year.

Although age and experience are often thought to be contributors to risk-taking, the results do not support this conclusion, as age, or being an apprentice or a foreperson are not significant indicators of risk-severity outcomes. However, the proportion of variability in the data that is accounted for by this model, as represented by the adjusted R^2 is 1.6 percent.

3.2 Logistic Regression Models

Table 4. Coefficients and Odds Ratios from the Regression of Risk-Severity Dummy Variable on Independent Variables

Variable	β	Sig.	Odds Ratio[a]
Occupational Group			
PLT	.682	.000	**1.978*****
Cable Splicer	.673	.217	1.96
(Electrician)	-	-	-
Age	.005	.549	1.005
Experience			
Apprentice	-.247	.392	.781
Foreperson	-.304	.19	.738
(Journeyperson)	-	-	-
Year			
2003	.695	.04	2.004*
2004	1.109	.004	**3.032****
2005	.91	.012	**2.483***
2006	.4	.205	1.492
2007	.397	.224	1.487
2008	-.021	.945	.979
2009	.113	.73	1.12
2010	.068	.823	1.07
2011	.436	.434	1.546
2012	.343	.513	1.41

[a] Odds ratios less than 1 predict a decrease in risk behaviour and less severe outcomes; odds ratios greater than 1 predict an increase in risk and severity of outcomes.

Risk-Severity Dummy Variable

The binary measure of the Risk-Severity scale was analyzed with logistic regression to assess whether the skewed distribution altered the substantive findings of the results (see Table 4). Being a PLT is associated with a 98% *(p>.001)* increase in odds of experiencing severe injuries and taking risks. The results did not remain significant for Cable Splicers. The results also indicate that the odds of experiencing a severe injury or taking risks rose by 100 percent in 2003 *(p>.05)*, by 230 percent *(p>.01)* in 2004 in by 148 percent *(p>.05)* in 2005.

Table 5. Coefficients and Odds Ratios from the Regression of Risk Dummy Variable on Independent Variables

Variable	β	Sig.	Odds Ratio[a]
Occupational Group			
PLT	.622	.002	**1.862****
Cable Splicer	.941	.048	**2.563***
(Electrician)	-	-	-
Age			
Experience			
Apprentice	.266	.318	1.304
Foreperson	.157	.451	1.17
(Journeyperson)	-	-	-
Year			
2003	.776	.006	**2.174*****
2004	.995	.001	**2.704****
2005	.632	.028	1.**882***
2006	.017	.954	1.017
2007	.219	.469	1.245
2008	.076	.805	1.079
2009	-.319	.35	.727
2010	-.266	.397	.766
2011	.321	.53	1.379
2012	.351	.81	1.42

[a] Odds ratios less than 1 predict a decrease in risk behaviour; odds ratios greater than 1 predict an increase in risk behaviour.

Risk Dummy Variable

Further logistic regression analysis was done using risk dummy variable to assess whether more or less risk was engaged in based on occupation, age, experience, and year (see Table 5). Being a PLT was associated with an 86% (*p>.01)* increase in odds of taking risks, compared to Electricians. The odds for Cable Splicers taking risks were 156 percent (*p>.05)* higher than Electricians. The odds ratio of engaging in risk taking increased by 117 percent in 2003 *(p>.01)*, 170 percent in 2004 *(p>.001)*, and 88 percent in 2005 *(p>.05)* when compared to 2002.

Table 6. Coefficients and Odds Ratios from the Regression of Severity Dummy Variable on Independent Variables

Variable	β	Sig.	Odds Ratio[a]
Occupational Group			
PLT	0.419	**0.021***	1.52
Cable Splicer	0.617	0.207	1.853
(Electrician)	-	-	-
Age	0.011	0.166	1.011
Experience			
Apprentice	-0.291	0.261	0.747
Foreperson	-0.432	**0.035***	0.649
(Journeyperson)	-	-	-
Year			
2003	0.224	0.427	1.251
2004	0.503	0.095	1.653
2005	0.438	0.133	1.55
2006	0.585	**0.044***	1.795
2007	0.665	**0.029***	1.944
2008	0.223	0.445	1.249
2009	0.414	0.184	1.514
2010	0.44	0.126	1.553
2011	0.215	0.663	1.25
2012	0.306	0.329	1.358

[a] Odds ratios less than 1 predict non-severe outcomes; odds ratios greater than 1 predict severe outcomes.

Severity Dummy Variable

Further logistic regression analysis was done using severity dummy variable to assess whether severity of outcome increased or decreased based on occupation, age, experience, and year (see Table 6). Being a PLT was associated with a 52 percent (*p>.05)* increase in odds of being severely injured when compared to Electricians. The Cable Splicer's severity log coefficient was no longer significant, indicating that they did not acquire significantly more serious injuries than Electricians. Being a Foreperson was associated with a 35 percent (*p>.05) decrease* in odds of being severely injured, when compared to Journeypersons. In 2006 and

2007, the odds of severe outcomes increased by 80 percent in 2006 *($p>.05$)*, and by 94 percent in 2007 *($p>.05$)*, respectively, when compared to 2002.

Given that all of the incidents stem from the same company, governed by the same safety regulations, with the same extent of safety training and are represented by the same union, how might these discrepancies in risk-taking behaviour be explained? What is *different* in how these occupations either assess or approach risk or safety regulations?

3.3 Document Analyses – Root Cause Reports

Seven root cause accident reports (the internal investigations of serious accidents or fatalities at WestTech) were analyzed. Of these, in all but one, relevant social dynamics that could have contributed to the outcomes were identified. Not all of these accidents involved PLTs, Cable Slicers or Electricians, but all provide information on the social dynamics in the work crews, and how accident investigations include (or do not include) worker behaviour in the social context as a potential contributor to outcomes.

The first incident report, investigated an accident at the Main Station[7]. This accident involved a worker, Gary, who received first and second degree burns to a large percentage of his body, while working at a power substation. Gary was working as a General Tradesman on a six-person crew. He had thirteen years of experience working in his position at WestTech, and all members of the team, other than an apprentice on site, had ten to twenty-six years of experience. The crew were working at the Main Station to remove and replace power equipment. As

[7] All names of locations and workers are pseudonyms

required by policy, before starting work, all members of the crew performed a documented (although unsigned) tailboard together. A tailboard is standard safety procedure at WestTech. All members of the team are asked to identify, communicate and document risks associated with the job, and create a work plan for how these risks will be managed to keep all workers safe. All members of the crew are required to participate and then to sign off on the documented tailboard, signifying that they understand the dangers of the job, and that they commit to the safety procedures in place to mitigate those risks. The tailboard for this incident included safety issues and a detailed job plan for each member of the crew. A manager and an Electrician worked in an adjoining room, while the Sub-Foreman and Gary worked on the equipment that was being changed out. The Sub-Foreman stopped the work to check on job details in another area of the substation, and told Gary to "stay put", indicating for him to stop work. A few minutes after the Sub-Foreman left, Gary recommenced work, without the order to do so, and diverged from the work plan that was agreed upon in the tailboard. At this point, Gary attempted to climb over a high voltage piece of equipment, which resulted in the triggering of an explosion, which was large enough to dislodge several windows in the substation, and caused significant first and second degree burns on Gary's body. It was clear from the report that Gary deviated from the work plan, engaged in not only risky, but prohibited behaviour when he climbed over the equipment, and was wearing only partial personal safety equipment (PPE[8]), because he was not wearing

[8] "PPE" or "Personal Protection Equipment" refers to all equipment that is worn by a worker to protect them during a job. Examples are safety goggles, rubber-insulated gloves, fire retardant coveralls, etc.

safety goggles. Gary was interviewed for the root cause analysis and indicated that he was "not content to be idle" and expressed that he knew what to do so he recommenced work without waiting for the Sub-Foreman's return. He indicated that although he was aware of the danger of climbing over the piece of energized equipment, he had done it before without a negative consequence. He also acknowledged that the rules in place against approaching dangerous equipment in the manner he did were in place to "keep people like [him] from doing what happened". The conclusions from the root cause analysis were that Gary required more safety training. Further to this, it was noted that although he violated a fundamental safety policy, and has problems with "discipline", further discipline would not be required, since he would be "motivated to change his behaviour and to abide by safety regulations" indicating that the consequences of his actions would be a "constant reminder to adhere [to safety rules] in the future".

The root cause report investigating Gary's accident is a good example of how social dynamics are left uninterrogated in safety investigations. Gary clearly violated safety procedures by not following his superior's directions, failed to clear his actions with the Sub-Foreman, did not wear proper PPE, and engaged in dangerous behaviour by trying to climb over live, high voltage equipment. Gary was a General Tradesman: a male-dominated, male-typed occupation. His actions align with what, in these contexts, can be interpreted as conventional masculine norms: defying authority, acting autonomously, and taking risks. It is difficult to assume his behaviour was carried out in ignorance: all workers were present during the tailboard, and consented to their role within the work plan, and further to this, Gary admitted that he was aware that his behaviour was unsafe in the post-accident interview. He also had thirteen years of experience at WestTech, which would suggest he had ample experience, and arguably knew the safety protocols. The conclusions of the root cause analysis suggested that Gary required more safety training, and that the repercussions of his actions were punishment and severe enough to ensure that he would not engage in similar behaviour again. The limited conclusions reached in this report indicate that other elements, such as underlying cultural norms were not seen as contributing factors. The recommendation that Gary required more safety training would make sense, had there been evidence that Gary did not know proper safety procedure; however, Gary's admitted that he was aware of the safety procedures which he breached, that he had engaged in this behaviour before, and acknowledged that the safety regulations were in place to stop "people like [him]" from doing that sort of behaviour. Here, Gary makes an open acknowledgement that he broke safety rules intentionally, and identifies himself as a risk-taker, by suggesting that "people like him" often engage in unsafe work practices, even after facing the repercussions of his actions. It seems unlikely that safety training will address this type of attitude, which, in light of the research that looks at gender and safety in similar fields, is plausibly a cultural norm, and likely to be held by other workers. In this incident, it could be argued that Gary is asserting a (dangerous) autonomy, which involves risk-taking, evidenced by not wearing all of the required PPE, by exposing himself to high-voltage equipment, and ignoring instructions from his superior. When he was questioned about his actions, he indicated that he was the sort of person who engaged in risk-taking behaviour, and even volunteered the information that he had previously done the exact same action that resulted in his current injuries. By identifying himself in this way, and reinforcing that he has taken on this sort of risk before, it can be argued that he is posturing in a way that aligns with conventional masculine norms. Because these elements are left uninvestigated, it is unlikely that they are considered relevant.

Another incident of note happened at Elmer Creek, which resulted in two workers being seriously injured. A Technologist (Adrian), and an Electrician (Thomas) were working on a high voltage electrical panel. Although the two had not worked together before, both had extensive experience. The job required Adrian to oversee Thomas' work on the panel: because the equipment that Electricians at WestTech work on is so diverse, the technologists' role is to be the expert on specific pieces of equipment, so he or she can oversee all work done by the Electrician, ensuring that proper and safe techniques are followed. A documented tailboard was completed, and Thomas was instructed to study the panel to become familiar with it, while Adrian went to have the equipment de-energized by other workers on-site, which would ensure it would be safe for Thomas to work on. A few minutes after he left, Thomas overheard Adrian speaking with another worker, indicating that the equipment had been de-energized. Instead of waiting for Adrian to return to supervise his work, Thomas decided to start work on his own. Although the correct equipment had been de-energized, Thomas had misread the diagram of the panel, and had transposed which wire he was working on with a live wire. Because he did not wait for the technologist' approval before starting the job, this error that would have arguably been caught by Adrian, resulted in Thomas coming into contact with electricity. Adrian returned to find Thomas being actively electrocuted and, in a panic, he reached out to knock him free. This resulted in Adrian being caught in the current as well. Another worker eventually pulled the workers free, but both suffered second and third degree burns on substantial portions of their bodies, and Adrian dislocated his shoulder. In the post-incident interview, Thomas indicated that he had noticed a small explosion of sparks when he started moving cables, had considered calling Adrian to discuss, but instead jiggled other cables to see if it happened again: when it didn't, he continued the job. This procedure was not an approved work routine. It was also noted in the report that sparks are a positive indication of working on a live line. The root cause analysis identified several causes of the incident, including failure to follow procedure since Thomas did not wait for inspection or instruction from Adrian, and the technical issue of a lack of clarity on the labels for the wires, which may have resulted in Thomas' transposing of the wire codes. The report suggests that more training and better labeling techniques would solve these issues. The "human factor", of communication issues is noted in the report as well. The remedy for this human error was to include "effective communications and listening" in the communications training module that workers are required to complete in their safety training.

Again, although a tailboard was performed and both workers signed off on this work plan, Thomas failed to follow safety regulations. Instead of waiting for Adrian to help draw up and approve his work plan, Thomas acted autonomously and moved forward with the job, without Adrian's supervision. He also engaged in risk-taking behaviour when he failed to follow proper technique when there were indications that the panel wasn't secure, following the sparking of the live cables. Rather than testing the voltage safely, with an appropriate tool, he jiggled the surrounding cables to see if he could replicate the sparking. The root cause analysis identifies that Thomas failed to follow procedure, and concludes that more training around proper technique and on "effective communications" will remedy these issues. Thomas, however, was aware of the safety regulations, as these were addressed during the tailboard, and he admitted that he had considered calling Adrian over to discuss the sparking, so he was aware that the situation was potentially unsafe. Instead of taking these precautions, he chose to risk testing the soundness of methods himself, once again using an unsafe (or risky) method to do so. Once again, the conclusions from the root cause analysis fail to consider why Thomas engaged in the risk-taking, and why he decided against waiting for Adrian's opinion, and instead acted autonomously. Never is the relationship between the two men interrogated as a factor to analyze as a root cause of the incident. Although the recommendation is made to modify the communication module in their training, the actual (and arguably underlying) social dynamics that impeded cooperative behaviour are again left uninvestigated.

Finally, and perhaps most illustratively, is the report which investigated a fatal incident involving Pete, who was a Power Line Technician. The crew was made up of six members: three senior employees who all had over thirty years of experience, and three new employees, who were all hired within two weeks to nine months prior to the accident. The job required the replacement of several transmission structures, and the work took place over two days. A documented tailboard was completed (although not signed), which included the identification of on-site hazards and unusual conditions, and an explicit statement to "watch [the] ground potential on [the] guys", indicating that precautions should be taken to ensure the crew working near live wires did not become a return-path for electricity, which would result in electrocution. The Sub-Foreman on site explicitly stated to workers that they should not rush, cut corners, or do work they weren't comfortable doing. This reminder was made because the Sub-Foreman took part in a safety meeting that morning, which discussed how commercial pressures should not be borne at the crew level. This is important to note as these workers were, at least at face value, encouraged to not engage in unsafe work or engage in work they didn't feel qualified to do or safe doing, regardless of commercial pressures.

The approved work plan was noted in the post-incident analysis to have cut a few corners, which impeded on the safety of the crewmembers. The Sub-foreperson ultimately has responsibility to approve the final work plan, although all workers must sign off to state that they agree with the soundness of the plan. Despite all members later acknowledging that they had felt the work plan wasn't entirely safe, they commenced work according to the plan. It was noted in the root cause analysis that one of the new PLTs approached Pete, who was a senior PLT, to discuss his concerns over the plan, but neither himself nor Pete brought this to the Sub-Foreman's attention or stopped work at that point. Early on in the job, Pete received a mild shock, or "bite", from one of the lines he was in proximity to. This was an important signal that some aspect of the work site had not been secured, and although four crewmembers noted they had seen this happen, none of them called for the job to stop in order to re-assess the site and techniques and perform a new tailboard, which is WestTech's policy. Instead, Pete carried on working, eventually being electrocuted, as voltage passed through his body at ten times the amount of current that is considered fatal. The same contributing factors that led to the earlier "bite" were concluded to also be responsible for the fatal accident.

It is important to note that in the post-incident interview, all members of the crew acknowledged that they had not felt the work plan in place was entirely safe, and although they had been reminded of their right to refuse unsafe worker minutes prior to the tailboard, none of them spoke up to voice these concerns. Further to this, one of the new PLTs raised his concerns with Pete about the work plan, but neither he nor Pete brought this to anyone else's attention. Although all of the workers indicated they had noticed that Pete deviated from the already unsafe work plan, no one voiced their concern about this either. The report does not go into detail or question why none of the crew spoke up, or investigate why the new PLTs concerns weren't acknowledged or validated. It isn't asked why no one on the crew stopped the job after Pete received the initial "bite" from the live line. These questions are not raised, and therefore they cannot be answered directly.

When analyzing the report post-hoc, it is helpful to remember that these workers were all PLTs, and their actions were conceivably embedded within, what WestTech calls a "cowboy" culture, marked by acts of autonomy, shows of courage, and disregard for authority. In this context, the workers' actions might be interpreted as aligning with normative expectations nested in a culture that valorizes risk-taking, displays of bravado, and autonomy. Perhaps the workers didn't feel comfortable questioning the competency of another worker on their crew when they failed to stop the job, upon recognizing it was unsafe. It is also possible, in this context, that Pete knew his actions were unsafe but felt compelled, or even comfortable, to take such a risk, given the proposed normative culture. The report also never addresses the fact that the crew reported that Pete appeared apprehensive continuing the job, after receiving the initial bite, although he, nor the other workers, spoke up or called for a new tailboard. Why would Pete continue to work, despite his apparent apprehension? Why would his co-workers idly observe his seemingly dangerous actions, despite their concern? Perhaps he, and the rest of the crew did not question the unsafe work or indicators of risk, because they saw the danger as an essential or expected element to both the work they did, and as an avenue to conform and to be accepted in a culture that values shows of bravery. However, these issued do not seem to have been recognized as relevant factors, and because of this, these issues were not probed.

The corrective actions recommended do not appear to acknowledge that workers actions were, when framed in the logic of the root cause report, irrational. The root cause analysis of this incident notes that safety regulations were not followed, and indicate that the Sub-foreman was, in fact, *aware* of the requirements. Additionally, the report acknowledged that all senior members of the crew had received recent training (within the last 2 years) on the hazards that were encountered. The corrective action calls for better training of crew leaders and potential crew leaders: something which seems to miss the 'root cause', given that he indicated that he was aware of the safety requirements that were violated.

It is also recommended that workers should be reminded that they are responsible for their own safety when at work, and that a presentation of this particular root cause report should be included in training for illustrative purposes. Additional training is recommended for workers to better learn tailboard procedures, with the aim of strengthening hazard identification. Again, it must be asked if these remedies will get at the underlying issues that seem to be present in the incident. All members of the work crew acknowledged that they knew Pete's actions were unsafe, that the work site had not been secured in a safe manner, and that they had completed and agreed to the tailboard, regardless of these concerns. These issues does not appear to be ones that will be remedied with more training, or hazard identification, or even reminders of being responsible for one's own safety. Although there was no record of the new members of the crew receiving training from WestTech, one did raise his concerns with Pete, and all admitted to recognizing the violations in safety protocol throughout the job, which suggests they could all readily and competently recognize violations of regulation and potential dangers. The conclusion of the report is that that the Sub-foreman and crew did "not have a full appreciation of the true nature of the hazards attached to their work". This lack of appreciation of the nature of the risk seems unlikely, given the information outlined above.

Although WestTech acknowledges the "cowboy" culture of PLTs, never are the tensions or dynamics between workers in this cowboy culture discussed or taken into consideration as a "root cause" of the incidents. It is arguable, given the existing literature that other male-dominated, male-typed sectors at WestTech, including other skilled trades, conform to a similar "cowboy" culture.

The incident analyses don't ask or answer why the workers were compelled to act in the ways they did, did not do what they were supposed to do, or follow the regulations they were supposed to follow, but instead usually recommend further training, indicating that they see these problems as stemming from individual or training issues, rather than being seen as indicative of deeper, social or cultural issues. Further to this, the qualitative descriptions of accidents in the database, which have the potential to serve as a rich source of socially contextual information, were often brief and vague. The lack of elaboration of the social context in these descriptions also suggests that WestTech does not consider social and cultural contributors to safety behaviour as important aspects of managing safety.

The qualitative accident descriptions in the database was coded to assess risk taking and rule violations, but given the lack of interrogation of the contextual information in the root cause analyses, it seems likely that these descriptors from the database omit important contextual information.

If so little is done to assess the impact of cultural and social contexts that could set the stage for increased risk-taking and violations of safety regulations, how can policy recommendations be expected to be wholly effective?

4 DISCUSSION

4.1 The Role of Risk Taking and Rule Violation in Overrepresentation

The results from the quantitative analysis suggest that PLTs and Cable Splicers engage in more risk taking behaviour and violate safety regulations more often than Electricians at WestTech. PLTs both engage in more risk taking and violate more rules when compared with Electricians, and also have more severe accident outcomes. Although Cable Splicers engage in more risk taking, this does not appear to result in more severe injuries. The results also indicate that risk taking and the severity of the accident outcomes fluctuate over the ten-year period.

The results from the OLS regression indicate that the risk-severity composite scores vary by occupation, which could conceivably be a factor in the variance of the disproportion to number of incidents. Certain occupations may have cultures, which normalize and even valorize risky behaviours. PLTs score higher on the risk-severity composite measure, when compared to electricians, and this result holds, when controlling for experience, age, and variations over time. Cable splicers seem to take even more risks than PLTs, when compared to Electricians. This would seem to lend support to the hypothesis that rule violations, and risk taking could account for some of this disproportionality. Perhaps these occupations have stronger cultural expectations to conform to conventional masculine norms. However, these results do not hold when the risk-composite measure was collapsed into a dummy variable. The results also indicate that while PLTs are still much more likely to take a risk or get in a severe accident, when compared to Electricians, Cable splicers are not. Cable splicers take significantly more risks and violate rules more often than electricians, but they do have more severe injuries than Electricians.

Both expressions of autonomy and risk taking are elements of conventional masculinity, and this becomes especially problematic in male-dominated, hazardous work settings. Doing dangerous work and being exposed to physical risk provides opportunities and social and financial incentives to male workers who conform to these cultural ideals (Ely & Meyerson, 2010; Paap, 2006). All three occupational groups included in the analysis are male-dominated, male-typed work, yet risk taking behaviours and rule violations are more evident in PLTs and Cable Splicers, when compared to Electricians. The "cowboy culture" that is synonymous with PLTs at WestTech fit with Ely and Meyerson's conceptualization of the culture of similar male-dominated dangerous occupations: "good" workers are those who are autonomous and brave, willing take risks and ignore authority (2010). This culture could account for increased safety regulation violations and risk taking, conceivably resulting in more frequent and more severe injuries: something that the data supports. Although Cable Splicers are not recognized as being a part of this "cowboy" culture, it is possible that such a small occupational group (just 0.3 percent of the total workforce) would draw little attention without analyzing the disproportionality of overall injuries and risk taking.

The increased risk taking and rule violations of PLTs and Cable Splicers fit with expectations drawn from the earlier literature. These occupations at WestTech involve high levels of physical risk, working in confined spaces and at heights, often while dealing with high voltage electricity. Both of these occupations are overwhelmingly male dominated, with no female Cable Splicers, and only two female Power Line Technicians employed over the ten-year period analyzed. Previous research suggests that men in similar kinds of occupations conform to conventional masculine behaviours to signify the authenticity of their masculinity (Schrock & Schwalbe, 2009). Because gender is a process, rather than a static concept (West & Zimmerman, 1987), if men conform to these cultural prescriptions, they reproduce a gendered identity through repetitive actions and interactions. In this way, actions at work can be understood as being a means to act out gender. Because organizations import cultural and gendered norms that exist in broader society, in these sectors, ideal workers may be conflated with the culturally defined prescriptions of the ideal man (Kolb et al., 2003; Martin, 2001). Following this, men who conform to the above prescriptions in these fields are rewarded both financially, by being recognized as competent workers, and socially, by gaining social prestige in a context that recognizes these attributes as desirable (Paap, 2006). In this way, work becomes an arena to demonstrate both cultural worth as a man *and* a worker. Paap argues that workers who meet this preconceived ideal are granted more status, and have more influence to shape the overall culture (2006). If this is the case, it is necessary to consider what overall impact that ideal workers in these fields have on the overall *safety* culture. In order to mitigate this influence, organizations must find ways to create cultures that conflate the ideal worker with a *safe* worker. Instrumental to this is to find ways to reward it: financially, but arguably more importantly to create a self-sustaining safety culture, socially.

Although the results from the Cable Splicers and PLTs seem to align with the expectation that male workers in these kinds of fields engage in conventional masculine behaviour, Electricians do not follow this same pattern. Electricians' engage in relatively low risk behaviour, violate fewer rules, and have less severe injuries than the other occupations analyzed. Results from the OLS regression and the logistical regression models all indicate that PLTs and Cable Splicers behave in ways that align with the conventional male role. Given that the analysis focuses on workers with similar exposure to risk from the same company, and are all occupational sectors that are culturally defined as male-typed (i.e.: skilled trades), and are male-dominated (though to differing degrees) how might this discrepancy be explained?

Of the limited research that exists on gender and occupational safety, there are few exceptions of compliance to the culturally normative male role in these sorts of fields. However, an exemption to this is found in what are called "high reliability organizations" (HROs) (Ely & Meyerson, 2010). HROs are organizations that have successfully avoided severe outcomes, despite being in an environment that is highly dangerous or complex, which would normally result in detrimental consequences (Roe & Schulman, 2008). These high-risk environments are largely male-dominated, and the work almost always conforms to culturally defined male-typed roles. Employees at HROs have been found not to adhere to conventional masculine norms, and instead, avoid taking risks, seek help when they are unsure, and admit mistakes they have made (see Bierly & Spender, 1995; Roberts et al, 1994; Roth et al, 2006). These behaviours are directly oppositional to conventional masculine norms that are so often part of similar organization's cultures, and certainly differ from what previous studies in similar work sectors have found.

Despite these organizations proving to be exceptional in their ability to avoid catastrophe, and their largely male-dominated, "masculine" contexts, gender has not been commonly evaluated in the literature (Ely & Meyerson, 2010). However, in the HROs that Ely and Meyerson analyzed, they found that although men still endorsed traditional masculine traits, they did not try to prove their masculinity by adhering to these roles when performing dangerous work (2010: 15). They concluded that organizational initiatives were the likely contributor to these outcomes, when allocating safety as their highest priority. Of note in these organizations, was the explicit and continued recognition and message that "macho" behaviour was unacceptable, because it was unsafe. In essence, organizational expectations of upholding safe behaviour reoriented workers "away from the goal of proving masculinity" and instead "oriented them…toward goals that were incompatible with upholding a masculine image: the safety and well-being of their coworkers", or what Ely & Meyerson call collectivistic goals (2010). Collectivistic goals are identified as a fundamental cultural shift away from gaining admiration for the individual, and instead, prioritizing the well-being of the whole. An individual workers sense of masculinity in these organizations appears to be superseded by a commitment to safety of all (Crocker & Canevello, 2008). Turning to psychological literature to explain the willingness of these workers to reorient their goals towards the collective, Ely and Meyerson argue that workers in HROs are prone to prioritize collective goals over and above their personal image, because this satisfies a "basic human need for relatedness", and is therefore more rewarding in contexts where it is made a priority. In these contexts, workers seem to be willing to risk their own *self-image* because they are socialized to see this as essential to achieving higher priority collective goals (Crocker et al., 2008). Is it plausible that similar sector-level moderators of safety behaviours operate to reign in risk-taking behaviours of Electricians at WestTech?

Other results from the regression models highlight the necessity of monitoring trends in risk-taking behaviours and changes in the overall severity of outcomes. The results, which indicate that risk taking, rule violations, and severity of outcomes varied more in certain years, as well as for more experienced workers, are important to note. Although it is impossible to interpret these findings without having more contextual information, tracking trends of risk taking over a length of time and identifying how these patterns correlate with policy changes or composition of the workforce could provide important insight into how organizational influences could affect safety behaviours and beliefs. However, without explicitly measuring risk-taking in accidents, it becomes difficult to assess the impact of these changes on the overall willingness to engage in non-compliant behaviours.

In order to assess whether the cultural norms and values differ from one sector to another, it is necessary to investigate how social dynamics and culture differ, how workers internalize cultural norms, and how this affects safety compliance. WestTech's current accident analysis and approach to safety provides little ability to assess these factors. There is no way to reliably assess the effect of cultural dynamics on safety attitudes and behaviours, given the data that is currently available and the mode in which they are collected. Accident investigations (such as the root cause reports) and qualitative descriptions of accidents in the database, both provide promising modes to incorporate and analyze social and cultural impacts on worker's actions and beliefs with regards to safety; however, this is not possible to do thoroughly due to the current mode and techniques of these investigations. Although WestTech uses these analyses help to answer *why* an incident occurs, the causes that are identified fail to adequately answer this question entirely: there is no analysis of the systemic underlying social factors, despite the fact that they are mentioned in the reports and are arguably relevant.

Analyzing qualitative data from in-depth reports of major accidents and from the qualitative descriptions of accidents in databases, provided insight into what is perceived and included as relevant contributing factors, and perhaps more tellingly, what is not. WestTech is not unique in the lack of attention paid to social factors in safety incidents. Although there are various accident analysis techniques used that include the role of *human* factors (Shappell & Wiegmann, 2001; Rearson, 1995; Rasmussen, 1997; Leveson, 2004), few, if any techniques, have included the analysis of *social* factors. It appears that by and large, approaches to analyzing safety incidents align more closely with the principals of the behaviour-based safety (BBS) management discussed earlier, which assesses individual behaviour removed from its cultural context, and tends to place responsibility for safety on the shoulder's of individuals, rather than the collective (Howe, 2000; DeJoy, 2007). Although this research project did not directly assess organizational or cultural influences on safety behaviours, the root cause reports of serious accidents sheds light on both the dynamics that existed between the workers involved, and how the organization defined the parameters of relevant information. This ultimately framed and confined their analyses, which limited the conclusions that could be reached from the reports. The main critique of the BBS approach to safety is that it treats the symptoms, rather than the causes, of safety non-compliance. As DeJoy argues, unsafe work behaviour at the worker level is best thought of as the "last link in a causal chain" (2005). Moving forward, underlying contexts that contribute to individual non-compliance and risky behaviour must be included and explored when assessing and documenting accidents.

4.2 Towards Safety Social Capital and Creating High Reliability Organizations

Although the management of safety social capital is a relatively new concept, high reliability organizations provide an effective example of how incorporating these principles can lead to better safety outcomes.

Safety social capital encompasses the collective values that exist and that are embodied within the networks in an organization and its workers towards safety. It is these values, norms, and networks that facilitate (or impede) a safer work environment (Rao, 20007). HROs are organizations that have successfully avoided major safety accidents despite being hazardous or complex work environments. They are also largely male-dominated, and include male-typed work. Ely and Meyerson identify organizational initiatives, which aim to manage cultural norms as the key factor to HROs positive outcomes (2010). As discussed earlier, HROs prioritize safety as their primary goal, and strategize to reorient (male) workers away from conventional masculine norms, which tend to be individualistic, and instead, to prioritize *collectivist goals*; that is, prioritizing the well-being of the collective, over the individual. In these contexts, workers take another kind of risk: risking their own masculine image. However, in these environments, the definition of the ideal worker is recreated as a safe worker: a necessary and fundamental shift. This is the management of social capital in action. HROs appear to recognize that collective values are embodied in social and formal networks, and find ways to infiltrate these networks in ways that establish a normative culture of safety. The HROs in Ely & Meyerson's piece honed in and identified "macho" behaviour as an impediment to following safety regulations, and explicitly stated that these behaviours were not conducive to a establishing or sustaining a safe work environment. 'Macho' behaviour became unacceptable. This is a critical step to develop a self-sustaining safety culture in organizations that tend to have cultures which value conventional displays of masculinity.

In order to manage safety social capital, organizations must first work to recognize the social networks, norms, and values, which undergird the existing safety culture. The CAMSoc method provides a unique opportunity from which to begin this analysis through existing data sources. The goal of the CAMSoc assessment method is to "extract *social* lessons learned from accidents", with the aim to identify how positive safety social capital is eroded. Data, including in-depth analyses of prior incidents, and databases of accidents, can be analyzed to identify the "underlying, organizational socio-features" which contribute to a safe or unsafe work environment (Rao, 2007). The examination should include an analysis of the social actors and the social dynamics that frame all aspects of a safety incident, including, if possible, the recognition of these dynamics and actors being embedded within specific cultural contexts. As evidenced by the analyses of WestTech's records, although these contributing factors may not be explicitly analyzed in the report itself, they are often included in descriptions of events. By identifying these elements, dysfunctional socio-features can be brought to the forefront, and an organization can begin to find ways to manage and remedy underlying issues. Although the analyses of the WestTech's root cause reports did not follow the exact CAMSoc method, the basic premise was followed, and plausible social factors and dynamics were identified. Although it is not possible from this analysis to determine *why* Electricians at WestTech do not appear to take risks or violate rules in the same way that Cable Splicers and PLTs do, it is plausible that there is some aspect of this occupation's culture that insulates it from the normative and conventional male-typed behaviour that seems to be prevalent in similar types of work. It could be that the culture of this occupation at WestTech has some HRO-like features, or that the greater proportion of women represented in the occupation somehow mitigates the prevalence of risk behaviours. The CAMSoc method recommends interviews with workers involved in accidents to identify underlying social factors. It is seems unlikely that without direct contact and interaction with the workers that the social factors which contribute to unsafe work can be fully assessed. Although it is not possible to assess these factors based on the data available, it highlights the importance of their inclusion in accidents and investigations. More importantly, these methods should be used to build self-sustaining safety cultures.

Although the data available provided an overview of the propensity of risk-taking, how accidents were investigated, and which factors were considered relevant, there were four notable limitations. Although the qualitative components provided information of the social dynamics and culture at play in these incidents, it is impossible to directly assess how this affected workers' non-compliance behaviours. Interviews with workers in each of these sectors would provide important insight into why workers engage in risk-taking, and whether there is normative pressure to do so. Because the proportion of women in these sectors is so limited, it would also be beneficial to interview female workers to understand their experiences in a male-dominated work environment. Secondly, although Cable Splicers were almost as over-represented proportionally in safety incidents as PLTs, they accounted for so few of the incidents that were analyzed. Additionally, although Cable Splicers appear to take more significant risks and violate rules more often, the data are positively skewed and the measure of spread suggests that the mean is not a representative average. Their results might not be reliable indicators of overall levels of risk that Cable Splicers engage in for both of these reasons. Thirdly, the correlation between the level of risk scale and the severity outcome was quite weak, which could indicate that the coding of the risk variable was not a valid measurement of risks taken. Lastly, and potentially tied to the third limitation, the proportion of variability in the data that is explained by the statistical model indicates that the variables included explain very little of the outcome. This could, however, be a result of not using or having a valid measurement of risk taking.

5 CONCLUSION

Although social influences, including gender, have been found to affect safety behaviour, very few if any safety management or analyses techniques look at these behaviours as significant contributing factors. Hazardous work environments are often male-dominated, and inherently dangerous work is often culturally defined as male-appropriate. This can result in a conflation where competent workers are recognized as those who conform to conventional masculine norms. Working in these sectors provides opportunities and arguably puts pressure on workers to behave in ways that are fundamentally unsafe. This research sought to explain how and if measures of conventional masculine norms varied across male-dominated occupations, and whether these indicators could account for some of the outcomes. Evidence of conventional masculine behaviours, such as engaging in risk, displays of bravado, and acts of autonomy were prevalent in all but one of the in-depth accident analyses, and Cable Splicers and PLTs seemed to conform to indicators of conventionally masculine normative behaviours. Electricians were the exception, however: given that they work at the same company, under similar conditions, and receive similar training, this leads to the question of whether this group differed culturally from the others. Despite these findings, these indicators seemed to explain very little of the variability of the data. Although this does not seem to align with previous literature, which suggests that these factors do help to explain accident outcomes, I suggest that the quality of the data affected the ability to assess risk, and therefore the ability to measure risk-taking behaviours. Richer qualitative data, in the form of more in-depth descriptions of the social context and events that preceded accidents in both the database and in the in-depth analyses of serious accidents could possibly remedy this.

This research also sought to identify effective organizational approaches to improving safety, particularly within male-dominated fields. It was argued that many existing approaches and analyses of safety incidents by organizations are insufficient, and when behavioural aspects of safety behaviour are identified, they are examined and framed as *human* (i.e.: individual) rather than *social* factors. This emphasis on the social factors of safety behaviours is crucial, because safety social capital is generated within the networks and the relationships of organizations. It is this social dynamic that must be examined, as it is through the norms and values that are transmitted through both formal and informal social interactions, that organizations can create self-sustaining safety cultures. The management of safety social capital and the CAMSoc method provides opportunities for organizations to examine how social factors have shaped previous and current safety incidents. Organizations, such as HROs, provide important insight into how safety social capital can be used to prioritize collective, safe behaviour in similar environments.

Works Cited:

Acker, J. (1990). Hierarchies, jobs, bodies: A theory of gendered organizations. *Gender & Society, 4(139).*

Antonsen, S. (2009). Safety culture and the issue of power. *Safety Science, 47,* 183-191.

Antonsen, S., Ramstad, L.S., & Kongsvik, T. (2007). Unlocking the organization: Action research as a means of improving organizational safety. *Safety Science Monitor, 1(11).*

Baring, J., & Hutchinson, I. (2000). Commitment versus control based safety practices, safety reputation, and perceived safety climate. *Canadian Journal of Administrative Sciences, 14(1),* 76-84.

Bierly, P.E., III, & Spender, J.C. (1995). Culture and high reliability organizations: The case of the nuclear submarine. *Journal of Management, 21,* 639-656.

Bigelow, P., Iverson, R., Zohar, D., Stuewe, D., Zho, Yonggan, Tate, G., & Samson, G. (2010). Focus on Tomorrow: British Columbia Workplace Safety Leadership Development. *Worksafe BC, File No. RS2007-DG 04. Retrieved on July 14th, 2012 from http://www.worksafebc.com/contact_us/research/funding_decisions/assets/pdf/2007/RS2007_DG04.pdf*

Bourdieu, P. (1984). *Distinction: A social critique of the judgment of taste.* Cambridge, Mass.: Harvard University Press.

Choudhry, R.M., & Fang, D. (2008). Why operatives engage in unsafe work behavior: Investigating factors on construction sites. *Safety Science, 46,* 566-584.

Coleman, J. (1990). *The Foundations of Social Theory.* Cambridge: Belknap.

Connell, R.W. (2005). *Masculinities.* Berkeley: University of California Press.

Courtenay, W. (2000) Constructions of masculinity and their influence on men's well-being: a theory of gender and health. *Social Science & Medicine*, 50(10), 1385-1401

Courtenay, W. (2000). Engendering health: A social constructionist examination of men's health beliefs and behaviours. *Psychology of Men & Masculinity, 1(1),* 4-15.

Crocker, J., & Canevello, A. (2008). Creating and undermining social support in communal relationships: The role of compassionate and self-image goals. *Journal of Personality and Social Psychology, 95,* 555-575.

Crocker, J., Nijya, Y., & Mischkowski, D. (2008). Why does writing about important values reduce defensiveness? Self-affirmation and the role of positive and other-directed feelings. *Psychological Science, 19,* 740-747.

DeJoy, D.M. (2005). Behavior change versus culture change: Divergent approaches to managing workplace safety. *Safety Science, 43,* 105-129.

DeJoy, D.M., Schaffer, B., Wilson, M., Vandenberg, R., & Butts, M. Creating safer workplaces: assessing the determinants and role of safety climate. *Journal of Safety Research, 35,* 81-90.

Ely, R.J., & Reyerson, D.E. (2010). An organizational approach to undoing gender: The unlikely case of offshore oil platforms. *Research in Organizational Behaviour, 30,* 3-34.

Geller, E.S. (2005). Behavior-based safety and occupational risk management. *Behavior Modification, 29(3),* 539-561.

Geller, E.S. (2001). Behavior-based safety in industry: Realizing the large-scale potential of psycology to promote human welfare. *Applied and Preventative Psychology, 10(2),* 87-105.

Gibson, M.K., & Papa, M.J. (2000). The mud, the blood, and the beer guys: Organizational osmosis in blue-collar work groups. *Journal of Applied Communication Research, 28(1),* 68-88.

Goldenhar, L.M., Swanson, N.G., Hurrell, J.J., Ruder, A., Deddens, J. (1998). Stressors and adverse outcomes for female construction workers. *Journal of Occupational Health Psychology, 3(1),* 19-32.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91,* 481-493.

Hannan, M.T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review, 49(2),* 149-164.

Hersh, J. (1998) Compensating differentials for gender-specific job injury risks. *The American Economic Review, 88(3),* 598-607.

Howe, J. (2000). A union perspective on behavior-based safety. In: Swartz, G. (Ed.), Safety Culture and Effective Safety Management. National Safety Council, Chicago.

Iaucone, D. (2005). "Real Men are Tough Guys": Hegemonic masculinity and safety in the construction industry. *The Journal of Men's Studies, 13(2),* 246-256.

Jablonsky, S.F., & DeVries, D.L. (1972). Operant conditioning principles extrapolated to the theory of management. *Organizational Behavior and Human Performance, 7(2),* 340-358.

Kimmel, M.S. (1996). *Manhood in America.* New York: Free Press.

Kolb, D., Fletcher, J., Meyerson, D., Sands, D.M., & Ely, R.J. (2003). Making change: A framework for promoting gender equity in organizations. In R.J. Ely, M. Scully, and & E. Foldy (Eds.), *Reader in gender, work and organizations* (pp.10-15). Malden, MA, Blackwell Publishing.

Krause, T.R. (1997). The behaviour-based safety process: Managing involvement for an injury-free culture, Second ed. Van Nostrand Reinhold, New York.

Leveson, N. (2004). A new accident model for engineering safer systems. *Safety Science, 42(3),* 237-270.

Mahalik, J., Locke, B., Ludlow, L., Diemer, M., Scott, R., Gottfried, M, & Frietas, G. (2003). Development of conformity to masculine norms inventory. *Psychology of men and masculinity, 4(1),* 3-25.

Martin, P.Y. (2001) Mobilizing masculinities: Women's experience of men at work. *Organization, 8,* 587-618.

Messerschmidt, J. (1996). Managing to kill: Masculinities and the space shuttle Challenge explosion. In Cheng, C. (ed.) *Masculinities in Organizations.* Thousand Oaks, CA: Sage.

Messing, K., Punnett, L., Bond, M., Alexanderson, K., Pyle, J., Zahm, S., Webman, D., Stock, S., & de Grosbois, S. (2003). Be the fairest of them all: Challenges and recommendations for the treatment of gender in occupational health research. *American Journal of Industrial Medicine, 43(6),* 618-629.

Messing, K., Courville, J., Boucher, M., Dumais, L., Seifert, A. (1994). Can safety risks of blue-collar jobs be compared by gender? *Safety Science, 18(2),* 95-112.

Mullen, J. (2004). Investigating factors that influence individual safety behavior at work. *Journal of Safety Research, 35(3),* 275-285.

Neal, A., Griffin, M.A., & Hart, P.M. (2000). The impact of organizational climate and individual behavior. *Safety Science, 34(1),* 99-109.

Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain –specific risk-taking. *Journal of Risk Research, 8(2),* 156-176.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology, 24,* 1-24.

Portes, A. & Landolt, P. (1996) The downside of social capital. The American Prospect Online, 7.

Prokos, A., & Padavic, I. (2002). 'There oughtta be a law against bitches': Masculinity lesons in police academy training. *Gender, Work, and Organization, 9(4),* 439-458.

Rao, S. (2007). Safey culture and accident analysis- A socio-management approach based on organizational safety social capital. *Journal of Hazardous Materials. 142(3),* 730-740.

Rasmussen, J. (1997). Risk management in a dynamic society: A modeling problem. *Safety Science, 27(2-3),* 183-213.

Ray, P., Bishop, P., Want, M. (1997). Efficacy of the components of a behavioral safety program. *International Journal of Industrial Ergonomics, 19,* 19-29.

Rearson, J. (1995). Understanding adverse events: Human Factors. *Qualitative Health Care, 4,* 80-89.

Reiss, A.J. (1967). On exploring the "dark figure" of crime. *The Annals of the American Academy of Political and Social Science, 374(1),* 1-15.

Roberts, K.H., Stout, S.K., & Halpern, J.J. (1994). Decision dynamics in two high reliability military organizations. *Management Science, 40,* 614-624.

Roe, E., & Schulman, P. R. (2008). *High reliability management: operating on the edge*. Stanford, Calif.: Stanford Business Books, an imprint of Stanford University Press.

Roth, E.M., Multer, J., & Raslear, T. (2006). Shared situation awareness as a contributor to high reliability performance in railroad operations. *Organization Studies, 27,* 967-987.

Saari, J. (1992). Successful implementation of occupational health and safety programs in manufacturing for the 1990s. *International Journal of Human Factors in Manufacturing, 2,* 55-66.

Schrock, D., & Schwalbe, M. (2009). Men, masculinity, and manhood acts. *Annual Review of Sociology, 35,* 277-295.

Shappell, S.A., & Wiegmann, D.A. (2001). A human error approach to accident investigation: The taxonomy of unsafe operations. *The International Journal of Aviation Psychology, 7(4),* 269-291.

Statistics Canada. (2011). *Employment by Industry and Sex.* CANSIM, table 282-0008. *Retrieved from: http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labor10a-eng.htmx*`

Turner, C., & McClure, R. (2003). Age and gender differences in risk-taking behaviour as an explanation for high incidence of motor vehicle crashes as a driver in young males. *Journal of Injury Control and Safety Promotion, 10(3),* 123-130.

West, C., & Zimmerman, C. (1987). Doing Gender. *Gender & Society, 1(2),* 125-151.

Westaby, J.D., & Lower, J.K. (2005). Risk-taking orientation and injury among youth workers: Examining the social influence of supervisors, coworkers, and parents. *Journal of Applied Psyschology, 90(5),* 1027-1035.

Williams, J. (2001). *Unbending Gender: Why Family and Work Conflict and What to do about it*. Oxford University Press.

Zohar, D., & Tenne-Gazit, O. (2008). Transformational leadership and group interaction as climate antecedents: A social network analysis. *Journal of Applied Psychology, 93(4),* 744-757.