



JOB AUTONOMY & SAFETY CLIMATE

Examining Associations in the Mining Industry

By Emily Haas, Margaret Ryan and Cassandra Hoebbel

PERCEPTIONS OF SAFETY CLIMATE pertain to an organization's prioritization of safety relative to other concerns, such as productivity or quality control (Naveh, Katz-Navon & Stern, 2011; Zohar, 2000). Relating to what organizations may prioritize, safety climate also entails the kind of behaviors that are expected, supported and rewarded (Schneider, 1990). Characteristics of safety climate can impact workers' own safety values, which, in turn, influence their behaviors (Naveh, et al., 2011).

Further, a positive safety climate has been linked to less burn-out and fewer errors, near-hits and incidents that result in lost time from work (Christian, Bradley, Wallace, et al., 2009; Nahrang, Morgesun & Hofmann, 2011). In this sense, not only has safety climate been identified as a potential leading indicator of incident occurrence, but also evidence exists that a positive safety climate might strengthen the impact of job factors (e.g., job autonomy, supervisor support, coworker support) on workers' proactive behavior (Bronkhorst, 2015), although these factors are not well understood (Parker, Axtell & Turner, 2001).

To that end, this article examines what role job autonomy, in particular, may have in forming workers' perceptions and subsequent OSH performance on the job. The authors begin by defining autonomy in the workplace to provide a consistent platform for studying the term.

KEY TAKEAWAYS

- Job autonomy is among the most important features of organizational design that ensures job satisfaction and motivation. It is important to understand how job autonomy may support the safety climate and subsequent behaviors executed by workers.
- The authors used two mine companies to compare workers' perceptions of safety climate and personal levels of proactivity and compliance on the job, one that incorporated autonomous work processes and practices, and one that did not.
- Job autonomy played a significant role in worker perceptions of their own proactive and compliant behaviors on the job, including taking initiative to address OSH problems, voicing concerns about OSH, and following rules and procedures.
- The discussion provides insights into specific autonomous work processes to provide direction for companies that want to improve aspects of their organizational management of safety, health and risks on the job.

Autonomy in the Workplace & Its Impact on Safety Climate

Job autonomy is the degree of independence and discretion that workers have in scheduling their work, managing tasks and ultimately performing tasks on their own (Hackman & Oldham, 1976; Parker, et al., 2001). Similarly, an autonomous work group is a small group of coworkers who operate as a separate unit within an organization with distinct authority and responsibility over how they carry out and complete shared tasks and goals (Cummings, 1978; Gulowsen, 1972). Not surprisingly, job autonomy is negatively associated with workers' stress levels (Pearson & Moomaw, 2005; Spector, 1986; Thompson & Prottas, 2006) and positively associated with their productivity and attitudes (Coch & French, 1948). This could be because in an autonomous environment, workers or crews often collaborate and coordinate with upper management and other coworkers to accomplish tasks (Willner, 1990). For these reasons, autonomy is often discussed as one of the most important features of organizational design to ensure job satisfaction and motivation (Parker & Wall, 1998). Examples of job autonomy that have been shown to increase workers' perceptions of organizational and managerial commitment to safety include:

- encouraging a coaching-oriented supervisory style over traditional management approaches;
- increasing operator control over machine maintenance;
- increasing ability to design personal job duties;
- providing decision-making authority for employees' primary work tasks;
- providing opportunities for self-rated performance appraisal;
- providing personal actions and communication for both discipline and rewards (Havermans, Boot, Houtman, et al., 2017; Lin, Lin, Lin, et al., 2013; Parker, et al., 2001; Pinion, Brewer, Doupbrate, et al., 2016).

For these reasons, job autonomy is a key work design variable that can be considered when trying to understand and improve safety climate (Havermans, et al., 2017; Parker, et al., 2001).

Research Objectives

Since safety climate seems to be a by-product of organizational structure, design and decision making, the authors wanted to understand how job autonomy may further support the safety

climate and OSH behaviors executed by workers. With this goal in mind, the authors used two mine companies to compare workers' perceptions of safety climate and personal levels of proactivity (taking initiative and solving potential risks) and compliance (following rules and procedures) (Christian, et al., 2009). One company (Company A) actively supports and structures its organization around autonomous work practices, going so far as to define itself as an autonomous corporation. The other company (Company B) emphasizes OSH through active trainings and preshift safety talks but does not explicitly incorporate autonomous processes and practices into its corporate and site-specific lingo. In other words, Company B operates on a more traditional organizational and hierarchical structure that exists in most normal day-to-day businesses.

Question 1: Is there a difference between workers' perceptions of safety climate for those workers who are employed at a mine company that incorporates autonomous work practices versus a company that does not?

Question 2: Is there a difference between workers' levels of OSH performance for those workers who are employed at a mine company that incorporates autonomous work practices versus a company that does not?

Methods

Data Instrument

The authors, NIOSH researchers, developed a safety climate survey. They identified six organizational factors and four distal, personal factors that are important in fostering OSH behaviors and outcomes. The performance outcomes measured within the survey were proactivity and compliance (derived from Zacharatos, Barling & Iverson, 2005). The authors adapted existing scales to all be a 6-point scale (strongly disagree to strongly agree) with 6 being the highest perception.

Data Collection & Participants

Approval was sought from the NIOSH Institutional Review Board (IRB) and the Office of Management and Budget (OMB). Then, the researchers engaged with management for two major U.S. mine companies with disparate levels and recognition of job autonomy. These managers volunteered a sample of their mines for participation. Both companies specialize in mining aggregates of various type and size for overlapping purposes, making their comparison in organizational processes more appropriate than if varying commodities were compared. The researchers traveled to each mine and spent 1 to 3 days at each site to administer the survey during preshift meetings, safety trainings or during breaks in mine offices. Five individual mine sites participated between April 2015 and February 2016. To the researchers' knowledge, everyone who was present completed the survey. Two mines from Company A ($n = 117$) and three mines from Company B ($n = 214$) participated. Table 1 (p. 32) shows a demographic breakdown of the participants by company.

Results

To compare both groups to the outcome variables measured in the survey (proactivity, compliance, near-hits), t-tests were used as the method of analysis to examine differences in the mean, or average, for each company. A t-test is a size measurement of the difference relative to the variation in the data where the greater the magnitude, the greater the evidence that there is no significant difference. Prior to running t-tests, the researchers

performed ANOVA analyses to check for statistically significant demographic differences between the participants for the two companies. Significant differences were found but then regression models were conducted to control these differences. After controlling for these differences, the companies still showed statistically significant differences on all dependent variables.

Research Question 1

The researchers' first question posed whether an organization that promotes and integrates job autonomy impacts workers' perceptions of organizational safety climate. First, the organizational climate scale contained the six organizational factors within the survey (i.e., organizational OSH support, supervisor OSH support, supervisor OSH communication, coworker communication, worker engagement, OSH training). An independent-samples t-test comparing organizational climate perceptions between the two companies showed that the overall scores for Company A ($M = 5.22$, $SD = .513$) were significantly greater than for Company B ($M = 4.66$, $SD = .792$); $t(276) = 7.265$, $p = .000$. This suggests that job autonomy has an important impact on workers' perceptions of safety climate. In addition, a series of t-tests were completed to compare each of the six individual factors that made up the organizational climate construct. Table 2 (p. 32) shows the results between the two companies.

In every factor, Company A, which promotes job autonomy within its organizational processes, rendered higher averages than Company B. The effect size quantifies the difference between two groups where a larger number supports even more of a significant relationship. Using Cohen's (1988) guidelines for interpreting effect sizes, organizational support, coworker communication, and training all rendered large effect sizes, almost or above .1; worker engagement showed a moderate effect; and supervisor support and communication illustrated a small to moderate effect.

Research Question 2

After exploring question 1, the researchers assessed whether a relationship exists between job autonomy and 1) workers' perceptions of their performance on the job; and 2) their actual performance in terms of experiencing a near-hit incident. These results are shown in Table 3 (p. 32).

The results indicate not only that job autonomy plays a significant role in worker perceptions of their own behaviors on the job, but also that workers who have more autonomy may experience fewer near-hits at work. Although compliant behavior rendered a large effect, proactive behavior and near-hits illustrated a very small effect, respectively (Cohen, 1988). This small effect size indicates that, although statistically significant, the difference in proactivity and near-hits between the two companies is trivial. Implications for practice are discussed next.

Discussion

The results show that miners employed with Company A have significantly higher perceptions of safety climate and, subsequently, improved safety compliance compared with those miners employed with Company B. The researchers were able to glean ways that these two organizations differed in terms of their job autonomy through short interviews with workers and managers who were also approved through the same IRB and OMB and completed at the same time as the surveys. For those workers who had an extra 15 to 20 minutes beyond the survey time, they answered questions about their safety and health management system, with a focus on leadership and communi-

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TABLE 1
PARTICIPANT DEMOGRAPHICS BY COMPANY

Company	Participants per site	Age	Experience with company	Job classification
A Autonomous	<i>n</i> = 22	18 to 24 (7%)	0 to 6 months (4%)	Hourly (83%)
	<i>n</i> = 95	25 to 34 (23%)	6 to 12 months (5%)	Salaried (17%)
		35 to 44 (30%)	1 to 5 years (32%)	
		45 to 54 (26%)	6 to 10+ years (60%)	
		55 to 64+ (15%)		
B Not autonomous	<i>n</i> = 51	18 to 24 (6%)	0 to 6 months (14%)	Hourly (72%)
	<i>n</i> = 92	25 to 34 (13%)	6 to 12 months (6%)	Salaried (28%)
		35 to 44 (16%)	1 to 5 years (24%)	
		45 to 54 (32%)	6 to 10+ years (57%)	
		55 to 64+ (34%)		

TABLE 2
RESULTS FOR SIX FACTORS FOR COMPANY A & COMPANY B

Outcome	Company A		Company B		<i>t</i>	Effect size
	Average	No. of participants	Average	No. of participants		
Organizational OSH support	5.11	110	4.07	208	8.347**	.18
Supervisor OSH support	5.06	116	4.72	211	3.111**	.03
Supervisor OSH communication	4.99	114	4.69	204	3.029**	.03
Coworker OSH communication	5.27	117	4.97	210	3.249**	.096
Worker engagement	5.08	115	4.48	207	4.504**	.06
OSH training	5.69	108	5.10	207	7.405**	.14

Note. **p* < .05; ***p* < .001

TABLE 3
RESULTS FOR OUTCOMES FOR COMPANY A & COMPANY B

Outcome	Company A		Company B		<i>t</i>	effect size
	Average	No. of participants	Average	No. of participants		
OSH proactive behavior	5.17	117	4.92	205	2.551*	.02
OSH compliant behavior	5.32	116	5.09	207	5.258**	.08
Number of near-hits experienced in past 6 months	0.26	117	2.34	208	-17.813**	.006

Note. **p* < .01; ***p* < .001

cation practices on site. Discussed here are some unique, autonomy-supportive practices established within Company A that could easily be incorporated into any high-risk industry.

Titles of Employees

Company A implemented a particular nomenclature for its workforce: All workers are referred to as associates. In broad terms, an associate is a colleague, partner or fellow employee. Although subtle, this terminology seems to put everyone in the company on the same level; even members of corporate staff referred to themselves as company associates. Then, when someone of a higher rank must provide feedback to or mentor others, rather than being called a supervisor, s/he is referred to as a coach. The term *coach* was implemented to emphasize: 1) the team aspect of all of the company's employees and of the autonomous work groups, in particular, who work together as a unit toward shared goals; and 2) the supervisor's role as an invested member of the team. This vocabulary was ingrained in the company structure and employees even used these terms during the brief intercept discussions.

This use of nontraditional role titles helps to further establish the company's departure from traditional notions of rank and hierarchy and reinforces its values of equality, accountability and responsibility, and teamwork. While researchers were present on site, coaches often referenced holding monthly coaching sessions to talk about what was working on site and what was not, and spending ample time giving appropriate, balanced feedback.

Any industry can introduce and follow this type of nomenclature. According to corporate staff at Company A, it is important for companies to encourage this nomenclature from the top. With this in mind, any CEO could make this decision and start renaming job titles to establish equity across positions.

Cross-Functional Teams

With respect to job autonomy, the literature frequently highlights the use of cross-functional teams in the workplace. During interviews at Company A, employees often referenced their cross-functional structure and the advantages of being involved and knowledgeable about site-specific issues. Several examples of cross-functional roles were present within the company and are described here.

Associate & Peer Evaluations

One example of cross-functional roles at Company A included hourly workers' ability to evaluate peers and salaried workers. As one salaried worker said, "They fill out a form on us too. It's cross-functional here." Employees embraced this responsibility, with comments such as, "We have cross-functional teams of associates that work together to develop continuous improvements." They also noted that ideas that have merit are often reviewed, discussed and implemented. Many employees at Company A noted their appreciation for the transparency provided during these continuous improvement processes.

In addition, peer evaluations were an aspect of autonomy referenced within Company A work processes. Peer evaluations not only served to assess employee performance, but the coaches on site also felt that the act of completing evaluations for fellow associates was a leadership development opportunity for associates. Employees seemed to agree, with one stating, "Our coaches don't work beside us, our peer associates do, so they look out for us and evaluate us." This specific process is similar to what previous research has argued: An increase in power for other employees does not negatively impact or decrease the power of those in leadership. This sentiment was evident in statements from those

interviewed: "Really our coach is our moderator/mediator. We're the ones who take care of stuff. The team agrees on things and we implement solutions ourselves."

This concept of peer evaluation is not necessarily new, and many occupational industries and large businesses engage in reverse mentoring and peer evaluations. However, making the process more visible and formal may better increase worker autonomy across levels within the organization.

Involvement in Root-Cause Identification & Risk Solutions

Continuing to support the aspect of joint decision-making and responsibility, Company A convened work groups and held joint meetings to examine the root causes of certain near-hits. Coaches said things such as, "We work with associates to develop corrective actions, give them the right tools for the job," and "we let associates determine things that need to be improved because they are the ones who have to implement the solutions on the job." These employees appreciated the involvement they had in improving work processes, from hazard identification to risk mitigation to evaluating controls.

Deci and Ryan (1987) argue that emphasizing control for workers and acknowledging their perspectives is a key aspect of autonomy-supportive supervisors. It is apparent that for such an organizational structure to work buy-in and support must come from the top down so that everyone feels comfortable both delegating and taking the lead on certain tasks. Again, many job sites already involve workers at all levels in root-cause analyses and solutions. For example, the healthcare industry is known for encouraging this type of root-cause participation (Bronkhorst, 2015).

Control Over Work Schedule

Finally, Company A employees are able to negotiate their work schedules and shifts (with their cross-functional teams) on an ongoing basis. The overarching management for Company A does not necessarily care when and who is working at the time, as long as someone is working. All employees can determine whether they want to work 4 days on, 3 days off or another shift schedule variation. As long as all are in agreement and all shifts are covered, employees can change their schedules as needed. This level of autonomy provides an opportunity for work-life balance, allowing employees to attend family events or visit the doctor if needed, that is not typically present in industries such as mining. Company A employees often referenced and appreciated this aspect of workplace adaptability.

Although perhaps more difficult to negotiate with employees, management can use other methods to encourage independent working throughout the day. For example, the developer of Post-It Notes credits the product's creation to 3M's philosophy of allowing employees to pursue their own projects for 15% of their paid time to support innovation (Minnesota Science & Technology, 2018). This method of allowing individuals more independence and flexibility in their work day can have mutual benefits for both the employee and the organization.

Conclusion

This study validates arguments (Gillet, Colombat, Michinov, et al., 2013; Moreau & Mageau, 2012) that companies and supervisors that exhibit autonomy-supportive behaviors facilitate employees' well-being and job performance. However, the study did not measure all organizational and personal factors, and other aspects may have influenced the results (e.g., time of data collection, types of equipment being used, incident history).

Limitations

Although the evidence in the current study is strong, limitations exist. First, due to the self-reported nature of the results, social bias is always a factor that must be acknowledged. Similarly, because the questions were subjective in nature, workers may have interpreted some of the questions differently. Second, this is only a small sample among a large industry with diverse commodities. These results cannot be generalized to all of mining or even to the aggregates industry. However, the moderate to large effect sizes across the results show support that other companies should examine their own organizational structures and autonomous processes.

Taking Steps to Improve Job Autonomy

Note that Company B's organizational structure, processes and hierarchical work crews are the norm across the mining industry. Tables 2 and 3 (p. 32) show the averages for each company. As shown, the averages for Company B were still in the positive range of 4 to 5 (somewhat agree to agree); therefore, workers did not have an overall negative perception of the safety climate on site. However, the significant differences between the company averages should prompt companies to examine whether adopting more autonomy-supportive practices at their specific site and from a corporate level might improve their safety climate and performance.

As a follow-up to this study, Company B, after receiving only its site-specific results, has engaged in a variety of new communication mechanisms to improve leadership and worker engagement efforts. The company added a coworker communication module to its annual refresher training for miners and incorporated hands-on activities to encourage workers to problem solve together in hopes that this would translate into site-specific solutions. As this example demonstrates, it is possible to incorporate new processes on site in an effort to improve job autonomy. However, as several managers noted throughout this study, it takes support from the top down to empower the workforce and instill a sense of accountability for safety and health in the workplace. **PSJ**

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