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## **CORRELATIONS BETWEEN INTERPERSONAL CONFLICTS AT WORK AND CONSTRUCTION SAFETY PERFORMANCE: TWO ONTARIO CROSS-SECTIONAL STUDIES**

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**Abstract:** Interpersonal conflicts at work (ICW) has been widely regarded as a job stressor; relatively few research studies have been conducted to measure ICW in the construction industry, not to mention the comparison studies of the conflict level on construction sites over time. ICW mainly has two forms on a construction site: conflicts with supervisors (ICWS) and conflicts with coworkers (ICWC). This study compared the occurrences of ICWS and ICWC on construction sites and correlated ICW with safety incidents, based on two survey datasets collected from 2004 to 2006 (911 surveys) and 2013 to 2016 (1281 surveys) on Ontario construction sites. Less ICW were found, compared with ten years ago. Positive correlations between ICW and safety incidents were confirmed for both datasets. Less work pressure reported on Ontario construction sites may explain the decrease of conflict level. Future study may focus on building conflict management scales and test their influence on ICW on construction sites.

### **1 INTRODUCTION**

Interpersonal conflicts at work (ICW) refers to negative interactions with others in the workplace (Nixon et al. 2011), e.g. argument with coworkers and supervisors. Occurrences of ICW are associated with considerable management and resolution time and cost (Brockman 2014). In the previous study by the authors (Chen et al. 2017), ICW was found to be a risk factor of construction safety performance based on a recent survey dataset collected from Ontario construction sites. To further verify the relationship between ICW and construction safety performance, this paper used another survey dataset collected by McCabe et al. (2008) from 2004 to 2006 on Ontario construction sites, and tested the correlations between ICW and construction safety performance based on this dataset. Moreover, little research has tracked the change of ICW level on construction sites in the past decade. To identify the changes of ICW on construction sites overtime, this paper compared the ICW level on Ontario construction sites based on the two survey datasets from 2004 to 2006 and 2013 to 2016 in the Ontario construction industry.

Demographic or occupational factors may be associated with ICW. For example, in the study by Appelberg et al. (1991), younger age groups were found to have more conflicts with others. In this paper, gender, age, mobility factors (i.e. number of employers and number of projects

in the previous 3 years of construction workers), and weekly working hours, were correlated to ICW.

## 2 METHODS

This study is survey-based. A multi-site data collection strategy was employed (Chen et al. 2015). The following sub-sections give the details of the survey questionnaire, data collection procedure, sample characteristics, safety climate measures, and analysis procedures.

### 2.1 Survey Instrument

A self-administered questionnaire that comprised demographics, attitude statements, and incident reporting was used to collect data (McCabe et al. 2008). The demographics section included questions about the individual’s characteristics, such as job tenure and number of projects in the previous 3 years. The incident reporting section asked the respondents how frequently they experienced safety-related incidents on the job in the 3 months previous to the survey. There are three categories of incidents: physical injuries, unsafe events, and job stress. Physical injuries, such as a cut or hernia, may be associated with an unsafe event, but no connection was made by the respondents. Similarly, unsafe events, such as a trip or fall, comprise events that respondents experienced but may or may not have resulted in an injury. Job stress symptoms relate to one’s ability to concentrate; one example is “felt constantly under strain”.

In the attitude section, six statements were used to measure ICW (Spector and Jex 1998) (Table 1). Conflicts with supervisors (ICWs) and conflicts with coworkers (ICWc) were differentiated (Chen et al. 2017). The questions asked about the frequency of the respondents getting into arguments with their coworkers and supervisors, and how often their coworkers or supervisors do rude or mean things to them. Five response choices are given: 1 (never), 2 (rarely), 3 (sometimes), 4 (quite often), and 5 (very often). High scores represent frequent conflicts with others.

Table 1. ICW measurements

Scales		Statements
ICWs	CS1	argue with supervisors
	CS2	supervisors rude to you
	CS3	supervisors do nasty things to you
ICWc	CC1	argue with coworkers
	CC2	coworkers rude to you
	CC3	coworkers do nasty things to you

ICWs: conflicts with supervisors;  
 ICWc: conflicts with coworkers

### 2.2 Data Collection

Both top-down and bottom-up methods were used to collect surveys. Top-down means that the team first contacted the head office management. If top management were enthusiastic about the project, they would engage their site managers and schedule data collection visits. The bottom-up method involved engaging the site managers first, who then worked to gain corporate permission. The process entailed four main steps by our research assistants (RAs): initiate contact at the site, follow-up and communicate with the site and/or the corporate management until approval is given, schedule site visits, and collect data. At least two RAs were on site to administer the surveys to workers. A procedure was strictly followed wherein the RAs arrived at the site and met the workers in a lunch trailer or other comfortable location. After the consent forms were collected, surveys were distributed. RAs provided immediate help

to workers if they had a question, which improved the reliability and completeness of the data. Surveys were strictly anonymous and were immediately collected upon their completion; no unfinished surveys were left behind and no follow-up was undertaken.

### 2.3 Sample Characteristics

Table 2 shows the characteristics of the two datasets. One dataset, 911 surveys, was collected by McCabe et al. (2008) from 2004 to 2006. To be simple, “2006” is used to represent this dataset. The other dataset, 1281 surveys, was collected by the authors from 2013 to 2016, “2016” is used to represent this dataset.

The mean age of the respondents was approximately 38 years for both datasets. On average, 15 years’ construction experience was reported for both datasets. The respondents had been employed by their current employer for 5 to 6 years on average. Decrease of mobility was found from 2006 to 2016, i.e. number of employers and projects in the previous 3 years decreased from 3 to 2, and from 11 to 9. The weekly working hours of the respondents were approximately 43 and 45 hours, respectively. The respondents also reported a very high safety training percentage (97.0% and 97.8%, respectively) and approximately 38% reported that they had experience as a safety committee member for both datasets. Fewer union members participated in the survey, likely due to the effort taken to improve participation from across the province. Similar mature workforces were found, with approximately 83% of the respondents being supervisors or journeyman in both datasets.

Table 2. Demographics of the sample

Demographics	Response range (2006/2016)	Mean or percent (2006/2016)
Gender	Male or Female	98.4%/98.1% male
Age	18-69/16-70	38.40/37.81
Years in construction	0.01-50/0.01-46	15.17/14.63
Years with the current employer	0.01-44/0.01-45	5.47/5.92
Number of construction employers in previous 3 years	1-50/1-100	2.95/2.28
Number of projects worked in previous 3 yrs	1-120/1-300	10.92/8.76
Average hours worked per week in previous month	8-70/4-100	42.47/44.50
Did you receive job-related safety training	Yes or no	97.0%/97.7% yes
Were you ever a safety committee member	Yes or no	37.8%/37.6% yes
Are you a member of a union	Yes or no	77.6%/69.2% yes
Job position	Supervisor	26.9%/27.4%
	Journeyman	56.3%/55.1%
	Apprentice	16.9%/17.4%

### 3 RESULTS

The average of the individual statements was calculated to obtain conflicts with supervisors and conflicts with coworkers. As shown in Table 3, Conflicts with coworkers and unsafe events had a significant decrease over the past decade, going from an average of more than 2 (where 2 represents rarely) to just less than 2. Conflicts with supervisors, which occurred less frequently than conflicts with coworkers, physical injuries, and job stress did not demonstrate a significant change.

Table 3. ICW and safety incidents (2006/2016)

Variables	Mean		
	2006	2016	Difference
ICWs	1.66	1.67	0.01
ICWc	2.03	1.96	-0.08*
Physical injuries	5.83	5.82	-0.01
Unsafe events	3.38	2.92	-0.45*
Job stress	3.57	3.46	-0.10

ICWs: conflicts with supervisors;

ICWc: conflicts with coworkers;

\*: differences are significant at the 0.01 level, independent samples T test.

Table 4 gives the correlations between conflicts with coworkers, conflicts with supervisors, and the three types of safety incidents. In a consistent way in both 2006 and 2016, both conflicts with coworkers and conflicts with supervisors had significantly positive correlations with the three types of safety incidents. For example, the correlation coefficient between conflicts with supervisors and physical injuries for the 2006 data is 0.23 ( $p < 0.01$ ), which means that physical injuries increase as the increase of conflicts with supervisors.

Distributions of individual statements of conflicts with supervisors and conflicts with coworkers are displayed in Table 5. On the whole, all the individual statements except “supervisors do nasty things to you” decreased. For example, respondents who never had conflicts with their supervisors increased to almost half of the respondents. More conflicts with coworkers than conflicts with supervisors were reported, which is consistent with the findings in Table 3. Moreover, on average, approximately 6% of the respondents reported that they had conflicts with their supervisors or coworkers quite often and (or) very often, in both 2006 and 2016.

Table 4. Correlations between ICW and safety incidents

Variables	Spearman's rank order correlations				
	ICWs (2006/2016)	ICWc (2006/2016)	Physical injuries (2006/2016)	Unsafe events (2006/2016)	Job stress (2006/2016)
ICWs (2006/2016)	-	0.56/0.68	0.23/0.23	0.27/0.23	0.32/0.26
ICWc ((2006/2016)		-	0.26/0.28	0.22/ 0.27	0.22/0.28
Physical injuries (2006/2016)			-	0.57/0.58	0.48/0.47
Unsafe events (2006/2016)				-	0.45/0.40
Job stress (2006/2016)					-

All the numbers in the table are significant at the 0.01 level (2-tailed).

Table 5. Distribution changes of individual ICW statements

Scale	Statements	Never	Rarely	Sometimes	Quite often	Very often
		2006/2016 (%)	2006/2016 (%)	2006/2016 (%)	2006/2016 (%)	2006/2016 (%)
ICWs	CS1	43.7/49.2	41.3/34.7	10.2/11.2	3.0/3.4	1.8/1.5
	CS2	46.2/53.0	36.2/29.4	12.8/11.3	2.1/3.8	2.7/2.5
	CS3	71.3/67.2	21.3/20.8	4.1/6.2	1.9/3.5	1.4/2.3
ICWc	CC1	23.7/28.5	46.4/43.2	23.1/21.7	4.3/4.5	2.5/2.1
	CC2	21.1/30.2	46.8/41.3	21.7/20.2	6.1/5.0	4.3/3.3
	CC3	52.3/55.0	32.9/28.9	10.5/10.6	2.9/3.0	1.4/2.5

ICWs: conflicts with supervisors; ICWc: conflicts with coworkers; CS1: argue with supervisors; CS2: supervisors rude to you; CS3: supervisors do nasty things to you; CC1: argue with coworkers; CC2: coworkers rude to you; CC3: coworkers do nasty things to you;

The number of women in the construction industry remains less than 2%, as reflected in Table 2. Table 6 shows differences by gender and by time. While women reported higher frequency of conflict than men in 2006, the trend reversed, with women reporting fewer conflicts than men in 2016, both with their coworkers and with their supervisors. While women's safety performance was similar to men's in 2006, they reported 25% more job stress. In 2016, the higher stress levels and physical injury rates were relatively unchanged, but women reported a significant reduction in unsafe events, both relative to men and relative to 2006. Interestingly, the higher job stress does not reflect in higher conflict.

Table 6. ICW and safety incidents by gender

Variables	2006			2016		
	Female (N=14)	Male (N=822)	Difference	Female (N=22)	Male (N=1124)	Difference
ICWs	1.79	1.64	0.15	1.52	1.65	-0.13
ICWc	2.05	2.01	0.04	1.80	1.95	-0.15
Physical injuries	5.93	5.91	0.02	5.91	5.81	0.10
Unsafe events	3.50	3.36	0.14	1.55	2.98	-1.43
Job stress	4.50	3.58	0.92	4.36	3.43	0.93

Table 7 shows the correlations between ICW, age, two mobility factors, and weekly working hours. Conflicts with supervisors (ICWs) had significant positive relationships with number of projects in the previous 3 years and weekly working hours for 2006 dataset. Conflicts with coworkers (ICWc) had a significant negative relationship with age and a significant positive relationship with number of projects in the previous 3 years for the 2006 dataset. Interestingly, these significant relationships diminished in 2016.

Table 7. Correlations between ICW, age, mobility, and weekly working hours

Variables	Spearman's rank order correlations			
	Age (2006/2016)	Number of employers in the previous 3 years (2006/2016)	Number of projects in the previous 3 years (2006/2016)	Weekly working hours (2006/2016)
ICWs (2006/2016)	-0.07/-0.02	-0.01/0.01	0.09/0.01	0.09/0.03
ICWc (2006/2016)	-0.15/-0.05	0.06/ 0.01	0.08/0.04	0.06/0.01

The numbers are significant at the 0.05 level (2-tailed) when the absolute values of the numbers are  $\geq 0.08$

The correlation coefficient between age and conflicts with coworkers for the 2006 dataset is the strongest ( $r_s = -0.15$ ,  $p < 0.01$ ). To verify whether the youngest group has the most conflicts with others (Appelberg et al. 1991), non-parametric tests (Mann-Whitney U tests) were conducted to determine whether conflicts with supervisors and conflicts with coworkers have significant differences between age groups (Table 8). It was found that ICWs of the youngest group is significantly more frequent than that of the oldest group for 2006 dataset ( $p < 0.05$ ); ICWc of the youngest group is significantly larger than that of the third age group and the oldest group for 2006 dataset ( $p < 0.01$ ); ICWc of the second age group is significantly larger than that of the oldest group 2006 dataset ( $p < 0.01$ ). Again, only for 2006 dataset, the youngest group had the most remarkable increase of conflicts with others, compared with the remained three age groups.

Table 8. ICW by age

Age quartile	ICWs		ICWc	
	2006	2016	2006	2016
<=28	1.77	1.66	2.18	2.02
29-36	1.65	1.73	2.09	2.00
37-48	1.63	1.66	1.97	1.96
49+	1.57	1.61	1.89	1.84

#### 4 DISCUSSION

The previous study by the authors (Chen et al. 2017) found that conflicts with coworkers explained 6% variance of unsafe events, which indicates the impact of conflicts on safety performance. This paper further validated the positive correlations between ICW and construction safety performance based on the survey dataset collected 10 years ago.

In general, ICW on Ontario construction sites decreased in the past decade. There are many possible reasons for the decrease, e.g. people's different personality, work pressure, and management commitment to building a healthy work environment, etc. We found that work pressure decreased significantly in the past decade (McCabe et al. 2016), which may partially explain the decrease of ICW. In addition, the decrease of job stress symptoms, although not significant, may also be associated with less conflict.

Approximately 6% of the respondents for both datasets reported that they had conflicts with others very often or quite often. These people need more attention from the supervisors and management. Training programs focusing on improving people's coping abilities can be beneficial toward improving safety performance (Chen et al. 2017).

In terms of the relationships between ICW and four occupational/demographic factors, only for the 2006 dataset, the youngest group reported a remarkable increase of conflicts with others, which is consistent with the findings by (Appelberg et al. 1991); and conflicts with supervisors were positively related to number of projects in the previous 3 years and weekly working hours.

Regarding future study, first, more research is needed to explore the reasons for the increase of the occurrence of one conflict behavior "supervisors do nasty things to you", and the reasons for the diminishment of the significant relationship between ICW and age, number of projects in the previous years, and weekly working hours. Second, given that no research has linked management commitment to preventing or controlling conflict level on construction sites, researchers may build management commitment to conflict management scales and test the impact of management commitment to ICW prevention and resolution on the occurrences of ICW.

However, the causal relationships and directions between ICW and construction safety performance need more practical evidence to be validated, i.e., whether ICW leads to more safety incidents, or whether more safety incidents leads to more ICW.

#### 5 CONCLUSION

This paper confirms the positive correlations between interpersonal conflicts at work (ICW) on construction sites and the occurrences of safety incidents. Less ICW were found, compared with ten years ago. Less work pressure may explain the decrease of conflicts. Construction companies may invest in building training programs focus on improving people's coping abilities. Future study may focus on building conflict management scales and test the influence of management commitment to conflict management on ICW.

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