Evaluating Behavior Based Safety Efforts in the Railroad industry

Work Practice Observations (WPO): A Pilot Study.

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Executive Summary

Evaluating Behavior Based Safety Efforts in the Railroad industry

This paper reports on a pilot project within the railroad industry that was charged with evaluating the efficacy of using employee collected behavior observations (Work Practice Observations or WPO) to improve safety in the workplace. The major questions were: Do WPO's make the workplace safer? Is trust violated in the WPO process? Does WPO interfere with workers normal duties? Why should workers perform a traditional management function?
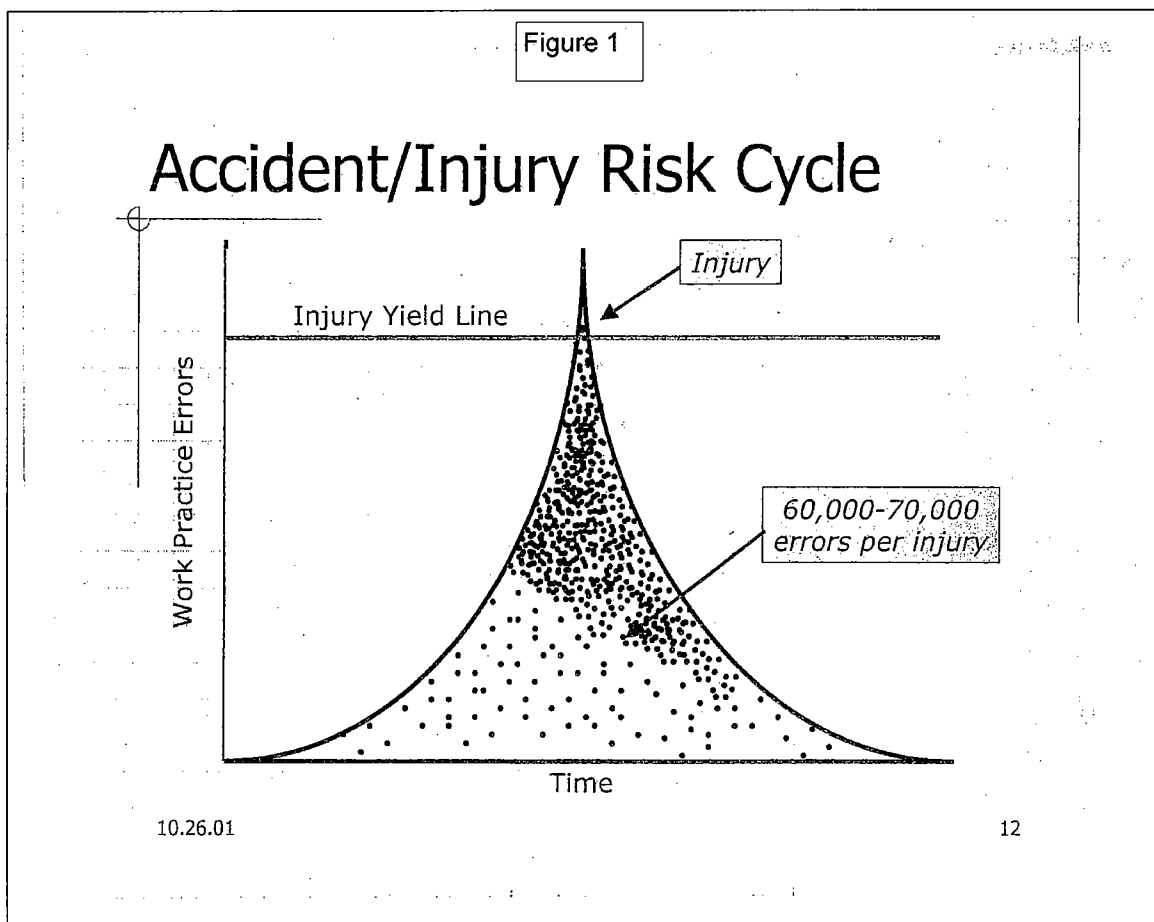
Management and Labor cooperated to identify an intermediate railroad terminal suitable for a pilot project. Data was collected by labor groups without any reference to individuals or work groups. The data provided a baseline for a labor sponsored safety intervention. Additional work practice data was collected to quantify the efficacy of the intervention. Employee collected data was compared to management provided data of the frequency of accidents, incidents, and injuries over the course of the pilot project for this location.

The pre-intervention employee data identified as much as 22 percentage point's difference between management and employee collected data of observed work practices. Post intervention data suggested the intervention resulted in a 17% improvement in work practices. This post intervention improvement was positively correlated to a 2.0 frequency or 57% reduction from the pre-intervention 3.5 to the post-intervention 1.5 events. Attitude surveys suggest there was "little or no" interference with normal duties 83% of the time. Two-thirds of participating workers found there was "little or no" loss of trust during the process.

In part, major conclusions suggest WPO provides a reasoned process for rationalizing work group experiences in the railroad industry. Recommendations and resources are provided for those interested in WPO.

WPO background and research question

Behavior based safety efforts in the railroad industry are hypothesized to offer a

solution to the last most troubling safety problems experienced by the industry. The

industry over the last quarter century has arguably experienced a reduction in railroad

operating accidents and incidents as judged from FRA statistics. Recently, a plateau of

sorts has been reached without marked improvement in railroad safety. Therefore, parts

of the industry have refocused their attention on behavior based safety. Behavior based

safety assumes that every work practice if properly performed using an experientially

and/or scientifically based "best practice" will result in a safer railroad industry. Figure

1,[1] illustrates the relationship between workplace errors over time and the corresponding

Figure 1

Accident/Injury Risk Cycle

Injury

Injury Yield Line

60,000-70,000
errors per injury

Work Practice Errors

Time

10.26.01   12

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[1] provided by railroad management

worker injuries. Reducing error frequency with behavior based safety efforts provides the basis for assuming workplace injuries will be reduced.

In order to achieve compliance with the assumption of best practice operation, the railroad industry advocates a three part process titled here as "Work Practice Observation" or WPO.[2] The three part process of identification, intervention, and evaluation on the face of it is highly reasoned. The details of implementing such a safety initiative in the rigidly structured (Stevens-Long, 1993), politically sensitive, and bounded work groups of the railroad industry and evaluating the efficacy of the WPO assumptions are the purpose of this pilot project.

In 2002, a safety summit was held between a US Class one railroad and the leadership of two union organizations representing the operating crafts (engineer and trainpersons) on that railroad.[3] The overall goal was to "create cultural change" in the railroad industry. An innovative "alternative handling" agreement was produced and accepted by the company and the two union organizations. The agreement moved the traditional disciplinary procedures from a punitive model to an educational model. The process evolved from an assumption that root causes of operating incidents and accidents would be identified when the threat of punishment resulting in job loss was removed.

As part of this agreement, an option of using a model of behavior based safety improvement was adopted. The company was free to request union participation in behavior based safety at individual locations throughout its system. Union organizations at each locality had the option to participate or not participate in the behavior based

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[2] The name of the process was provided by Railroad Management.
[3] Railroad management will be identified as Management A. The Union organizations will be identified only as Organization A and Organization B. No specific group identifiers are attached to these labels to respect the privacy of the participants.

safety effort. All cooperation and participation was voluntary at the organizational, group, and individual levels.[4]

WPO is part of an overall effort designed to produce cultural change within an organization. This project did not evaluate the overall premise of cultural change and/or the success or failure of other elements in the aforementioned "alternative handling agreement" that provided the impetus for WPO.

Further, it should be noted that while work practice observations may be labeled a "reductionist"[5] approach to railroad safety, the behavior based assumptions are incorporated into the previously established process of work place "environmental safety" (physical plant modifications or improvements). The environmental focus of railroad safety is on going in the traditional labor/management safety efforts in the workplace. WPO is suggested as an additional tool, not a replacement, for existing rail safety efforts.

Having said that, it has been argued that the implementation of combined behavior based and environmental safety initiatives do not constitute a "system approach" to safety in the railroad industry. Noticeable deficiencies raised during debates internal to the pilot project included "systemically" based biases and assumptions that lead to operating safety issues in the industry. For example, it was argued that education and training are not emphasized and integrated into the system from the outset. Rather WPO was argued to be a post hoc intervention to address imbedded safety issues

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[4] From exit interviews, Management A tended to view participation as a part of their prescribed duties rather than an individual choice. On the other hand, Organization A tended to view participation as a choice rather than a part of their assigned duties.

[5] Reductionism is defined as a process of understanding a system by dividing it into its sub-parts for analysis. This theoretical assumption is challenged by system researchers as failing to incorporate the emergent properties of complete systems. Arguably, these properties emerge from the relationships between the sub-parts, but do not exist within the subparts.

that from a systemically integrated educational paradigm may have been avoided in the first place. These arguments, concerning the underlying debates of WPO arising out of this pilot project, are beyond the scope of this evaluative effort.

Philosophical debates aside and working with the cards that are dealt, a pilot project was proposed to evaluate the utility and efficacy of Work Practice Observations.

Specifically, the pilot project was charged to answer the following questions:

1) Does work practice observation make the work place safer?

2) Does work practice observation break bonds of trust with railroad work groups that would have an overall negative impact in railroad safety operations?

3) Does work practice observation interfere with the normal performance of the railroad workers assigned duties?

4) Why should the workers perform traditional management functions of identification, intervention, and evaluation in the work place?

This pilot project was designed to provide answers to all of these questions in an evaluative process. This research might provide reference for other work groups from both Organization A and Organization B to inform their own decisions on participation with behavior based safety efforts. The concerns expressed in the pilot project groups were consistent with concerns expressed at various other locations in the industry.

Finally, this pilot project began concurrently with the implementation of Locomotive Remote Control (LRC) technology at this location. LRC has had significant social, economic, and political effects both inside and outside of the railroad industry. Management A was cautioned by Organization A to avoid concurrent implementation of

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these two changes in the workplace. Management A chose dual implementation. The
effects of LRC implementation on WPO will be discussed in the conclusion

In the method section below, the pilot project is discussed outlining the process
used to address Organization A's conditions. In the results section, the results of both the
WPO process and the attitudinal surveys about WPO are reported. The choices exercised
by the various groups to participate in the WPO process, and the corresponding effects on
the process, are discussed in the conclusion. Finally, recommendations for future
research, as well as available resources, are offered for groups considering behavior
based safety efforts.

Method

In late 2002, Management A approached the leadership of operating personnel

represented by Organization A and Organization B at numerous locations with a proposal

to participate in a behavior based safety process. Management A suggested a process

that provided for employees to collect information about operating behaviors in the

railroad industry. In this suggestion, members from the organizations would identify a

"Coordinator" to act as liaison, trainer, data collector, and troubleshooter for the process.

The actual process was threefold: identification, intervention and evaluation.

First, information would be collected by workers to identify a baseline of work

practices as compared to "best practice" that had been defined previously by the railroad.

Second, an intervention process would be used to attempt to achieve compliance with

best practice to the railroad goal of 95%. Finally, workers would collect data again to

evaluate the change in the work practices in the work place.

From this initial request, a 60 day debate resulted in both organizations at a

specific location[6] before the members of the respective organizations were able to reach

decisions. Organization B declined to participate. Organization A agreed to participate

in a pilot project at a location. The location was chosen by Organization A for its

intermediate size, its stable and experienced workforce, and its general suitability to

complete an evaluative process. Organization A conditioned pilot project participation

on several specific concerns.

First, Organization A asserted that there could be no "cross-craft" observation of

Organization B members by Organization A members. Second, the work practices that

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[6] For the purposes of this project "location" is defined as a railroad terminal and includes other physical
locations that are serviced by crews that originate from that railroad terminal.

Organization A would observe must be relevant and have the potential to significantly impact the safety of workers in the designated railroad terminal. Third, there could be no identification of any individual railroad worker, railroad assignment, no times, no dates, and no specific locations of events from the collected data. The data would be "washed," meaning any identifiers would be removed, by the Organization A chosen WPO coordinator prior to distributing the information to interested labor and management groups for intervention and evaluation. Finally, there could be no punitive or coercive use of the data by railroad management either locally or at the system level.

There was no compensation or benefit for Organization A's cooperation or individual member's cooperation. The only inducement was the "hope" that railroad safety would be improved because of the WPO process.

Both Organization A and Organization B allowed their members to evaluate participation past the original decision to cooperate or not cooperate. Organization B voted twice on whether to cooperate. Both times Organization B chose not to cooperate. Organization A reevaluated its decision to cooperate monthly throughout the pilot project. Each month Organization A evaluated the process looking at the conditions of cooperation and whether any restrictions established by Organization A had been violated. Finding each month that the agreed process was observed, Organization A's decision to cooperate did not waiver throughout the pilot project.

Organization A chose a "coordinator," who recruited volunteers to be trained as observers.[7] The coordinator performed the training of volunteers off railroad property
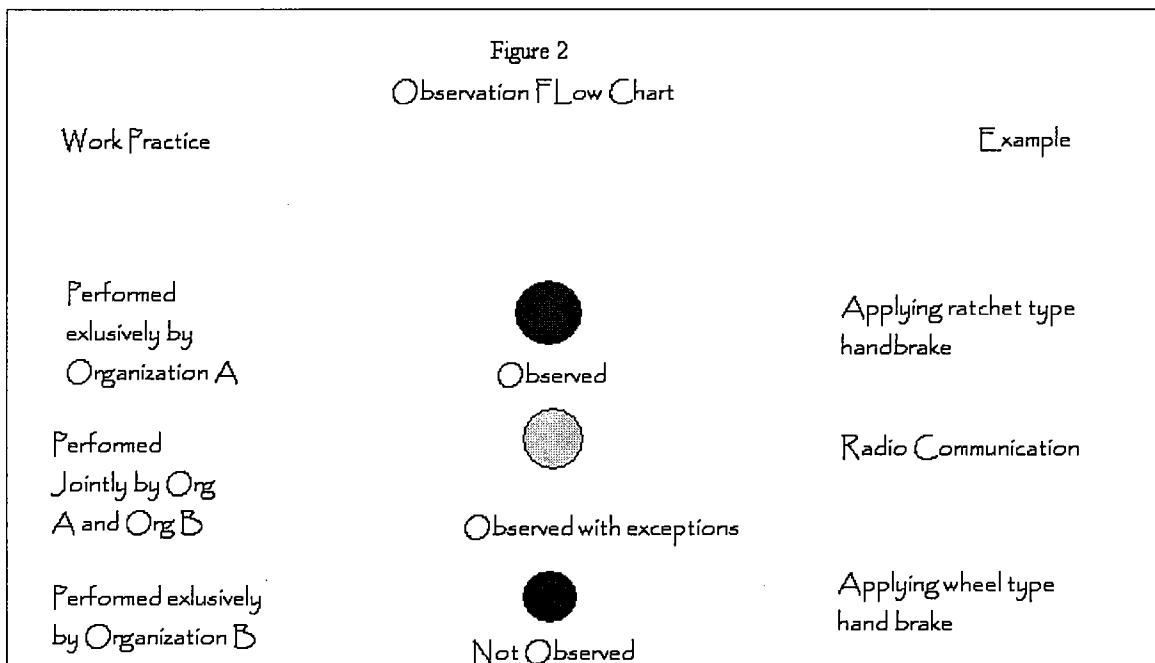
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[7] Locomotive Remote Control (LRC) implementation at this location had a negative impact on observer recruitment and observer retention in the WPO pilot project.

with only Organization A members present. Management A assumed expenses for the observer training.

<div align="center">Meeting Organization A's Conditions</div>

No Cross Craft Observation

Since all work groups are comprised of members from Organization A and Organization B, defining cross craft observation was complex. While many work practices in a group of workers are performed individually in railroad operations, many complex tasks are performed jointly between members of Organization A and Organization B. It is not possible to observe Organization A work practices in all circumstances without also observing the combined efforts of members from Organization A and Organization B. Severely restricting observations would provide relevant information on only a portion of the tasks that impacted the safety of Organization A members. Further, severely restricting observations would not provide

Figure 2
Observation FLow Chart

Work Practice		Example
Performed exlusively by Organization A	● Observed	Applying ratchet type handbrake
Performed Jointly by Org A and Org B	◉ Observed with exceptions	Radio Communication
Performed exlusively by Organization B	● Not Observed	Applying wheel type hand brake

answers to significant questions as formulated for the pilot project by Organization A members.

Organization A decided that it would observe tasks that are performed exclusively by Organization A workers and conversely it would not observe tasks performed exclusively by Organization B workers. However certain tasks, such as a radio communication, that are shared between workers of the two organizations would be observed with exceptions (see Figure 2.) For example, when the task was shared by Organization A and Organization B members, the observers were allowed the discretion to determine if the observation was primarily of the work performed by Organization A or Organization B and to apply the "no cross craft observation" prohibition as necessary.

Observations must be relevant to Worker Safety

In order to address safety issues most relevant to railroad worker safety, three resources of information were consulted. First, the Switching Operations and Fatality Analysis (SOFA) report was used to provide a basis for choosing work practices.[8] Second, career ending accidents or incidents that had occurred at this location over the past 25 years were looked at for additional safety issues.[9] Finally, relevant data from Federal Railroad Administration (FRA) statistics were analyzed to identify safety issues specific to Organization A workers. From these sources, 8 work practices were identified for observation: Going in between cars, shoving cars, getting on and off railroad equipment, radio rules, job safety briefing, walking, tying ratchet type handbrakes, and two crews working in the same yard.

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[8] The SOFA report is an analysis of 76 railroad switching fatalities analyzed jointly by the Federal Railroad Administration (FRA), US railroads, and railroad unions.

[9] This location had not had a railroad operating fatality in the past 25 years, but there were numerous career ending accidents or incidents at this location during that time.

<u>No identification of participants</u>

In order to achieve no identification of individuals or groups, observers produced a pocket sized hand book with railroad defined best practices for the 8 work practices chosen above by Management A and Organization A in a collaborative process. Each observer would tally observations over a reporting period, then forward observations in a self addressed stamped envelope to the WPO coordinator for compilation. After inputting all data, reports were prepared showing the work practice, the total number of observations, and the percentage of observations deemed to be "safe" and "at risk." All data sheets were held by the Organization A coordinator and destroyed at the end of the pilot project.

<u>No Punitive or Coercive use of the Data</u>

Each month, and more often if necessary, Organization A "polled" its members for any indication of punitive or coercive use of WPO data by Management A. Members of Organization A were asked to be conscious of the WPO pilot project and produce any evidence that might be considered punitive or coercive use of WPO data. Questions or concerns were forwarded to the WPO coordinator for analysis and investigation of Management A operating practices that might be linked to WPO data.

<u>Evaluating WPO on the "Trust" issue</u>

In addition to WPO data, surveys addressing issues of trust, interference with normally assigned duties, experience of safety improvements from WPO, the importance of labor/management cooperative efforts, and inclusion issues were completed. Members from Organization A were surveyed at the beginning of the pilot project and again at the completion of the pilot project. Members from Organization B were surveyed at the

intervention point of the pilot project. Management A was surveyed at the end of the pilot project. In addition, exit interviews were performed either in person or in writing for Management A and Organization A at the end of the pilot project.

The Intervention

After three reporting periods, a baseline was identified of work practices at the pilot project location. From this baseline identification, an intervention was formulated by Organization A and Management A. Organization A held a "marathon" safety meeting at the observed location. For 18 ½ hours, workers of all shifts were presented with the WPO process. A film produced by Management A and Organization B was shown for workers explaining the WPO process. Following the film, Organization A presented the WPO process as modified for use at this location. Workers were presented with the data, the importance of the issues addressed to work place safety, and provided with information suggesting "individual responsibility" to best practice in the work place would provide the greatest improvement to worker safety.

Even though Organization B did not approve participation in the WPO process at this location, Organization B approved and held a marathon safety meeting one week after the Organization A safety meetings. Organization B objected strenuously to Organization A participating in the WPO process without Organization B participating. Organization B further objected to the definition of cross craft observation employed by Organization A. Organization B further asserted that the data collected in the WPO process was tainted by the political debate surrounding remote control operation and lacked objectivity. Beyond these objections, Organization B addressed the importance to worker safety of the issues focused on by the WPO process at this location. Organization

B officially advocated a process of watching out for each other to avoid at risk behavior suggested by the WPO process.

Management A did not participate in the safety marathons of Organization A and Organization B at the request of those organizations. Management A did cooperate and support the interventions of Organization A and Organization B.

During the intervention process, a hiatus was observed in the WPO data collection. After the intervention process was completed, WPO data collection resumed. The goal of the post-intervention process was to collect approximately the same number of observations as the pre-intervention process.

Final Evaluation

Once the goal of the post intervention data collection was achieved, the pilot project was completed. Exit interviews were held with Management A and Organization A observers. Information from the exit interviews, the numerous surveys, the WPO data, and safety data of accidents, incidents, and injuries provided by Management were used to formulate the conclusions and recommendations discussed below.

Results

WPO Results

Organization A performed 2363 pre-intervention and 2505 post intervention

observations across the 8 work practices identified by the WPO process. Pre-intervention

data collected by Organization A suggested worker compliance with best practices as

defined above averaged 73.09%. This contrasts with Management A collected

information that asserted a 90-95% compliance with best practice at this location.

Following the interventions by Organization A and Organization B, worker

compliance with best practice averaged 88.18%, a 15.09 percentage point or 17%

improvement from the pre-intervention reporting. The railroad goal of 95% compliance

was not achieved overall, though it was achieved on numerous portions of the various

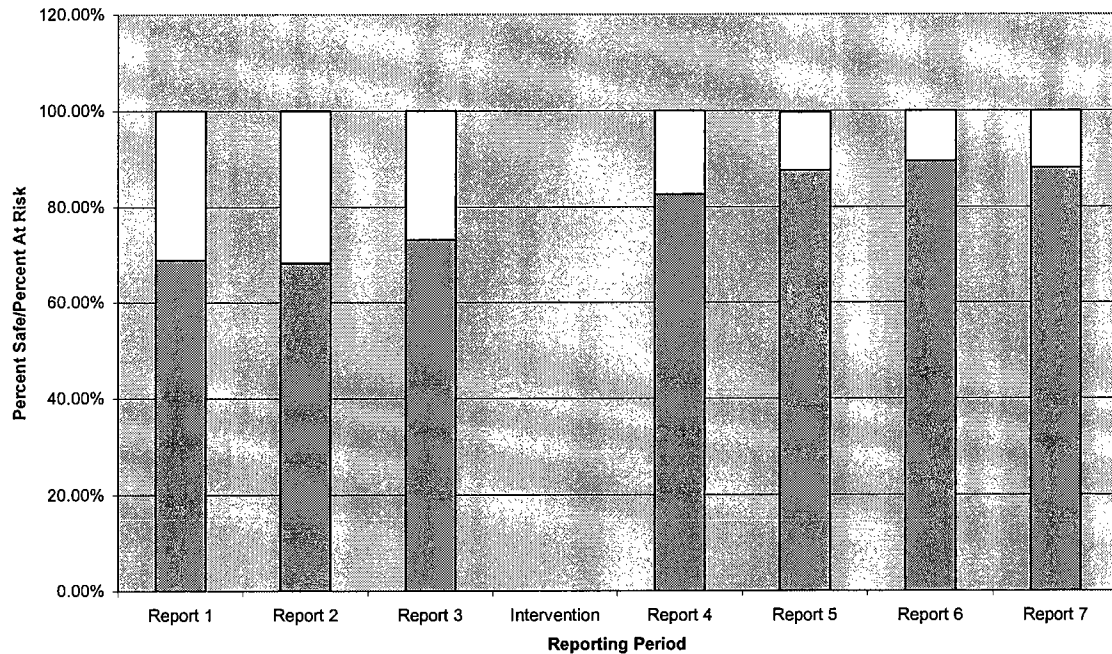categories observed (see Figure 3).

Figure 3
WPO Reports Final

Figure 4 provides accident, incident, and injury statistics[10] for this location for the periods of the pilot project and the period immediately preceding the pilot project[11]. This is compared to the same period in 2002. For the entire year 2002, this location reported a 2.0 frequency ratio of accidents/incidents/injuries. For the pre-intervention and a period immediately preceding the pilot project, this location had a frequency ratio of 3.5. The frequency ratio in the corresponding period of 2002 for this location was 2.25. For the post-intervention period, the frequency ratio was 1.5 as compared to 1.5 for the same period in 2002. This was a 57% reduction in the frequency of accidents, incidents, and injuries from the pre-intervention to the post-intervention period.
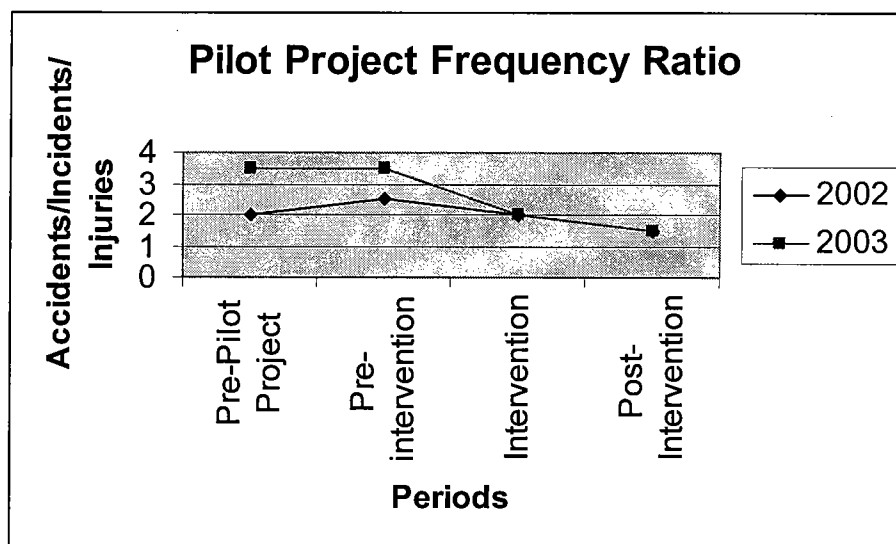
Figure 4

Figure 3 illustrates the improvement in the safe application of best practice over the post intervention period from the pre-intervention period. This corresponds to a

[10] For the purposes of this report, accidents, incidents, and injuries (both reportable and non-reportable) were all considered equally and divided by the appropriate reporting period for a single frequency ratio at the pilot project location. A severity ratio was not generated due to delays in the process associated with generating this information. Safety data was not related to total man hours worked. Though implementation of remote control operations caused dislocations in the work force, the overall operating work force did not change appreciably year over year.

[11] The pilot project and the period immediately preceding the pilot project was 7 months.

decline in the frequency ratio of accidents/incidents/injuries at this location (Figure 4) during the same period of time.

Results of Attitude Surveys[12]

Eighty three percent of Organization A reported little or no interference with their normal duties while participating in the WPO pilot project. This compares to 100% for Management A and 61.53% for Organization B. Twenty three percent of Organization B did not know how much WPO interfered with the performance of their duties.

At the beginning of the pilot project, 66% of Organization A did not know how much time was involved by participating in WPO. At the end of the pilot project, 83% of participants rated the time expenditure as "a little." Organization B reported by 84% that either little or an unknown amount of time was expended on WPO. On the other hand, 66% of Management A reported "some expenditure of time" on WPO.

Sixty-seven percent of Organization A reported little or no trust was violated both at the beginning of the WPO pilot project and at the end of the project. Management A reported no violation of trust 100% of the time. Fifty four percent of Organization B reported little or no trust was violated by the WPO process, while 38% did not know if trust had been violated.

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[12] Appendix B graphs all the responses to attitude questions provided by Organization A (at both the beginning and end of the pilot project), Management A, and Organization B.

Conclusions

Does WPO make the work place safer?

The data indicate that the WPO process was able to identify work practice compliance. In addition, the intervention was able to modify behavior at this location to improve compliance with the railroad defined best practice. Further, there was a decline in the frequency of accidents, incidents, and injuries correlated to the intervention and documented in the post-intervention period. The frequency of accidents, incidents, and injuries in the pre-pilot/pre-intervention period was greater than the same period of 2002 resulting in a 36% greater decline in the WPO pilot project period than the corresponding decline in 2002.

It should be noted that a comparison of the favorable outcome of the WPO project with the overall regional safety data[13] shows an improvement in safety as a function of the frequency ratio, even at locations where WPO was not a factor.

It is not possible to assert without qualification a direct "cause and effect" between WPO and safety in the workplace. However, there is evidence from this research to suggest that a correlation exists between WPO and safety. This pilot project was implemented in a manageable, though statistically small location. Further research from additional WPO efforts may confirm in the aggregate the results reported here.

Does WPO break bonds of trust?

Nearly 2/3 of Organization A respondents attribute little or no trust is broken from participating in WPO. For Organization B, half of all respondents feel little or know trust is broken in the WPO process. Forty percent of Organization B "did not know" how much trust was broken in the WPO process.

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[13] Regional data was not fully accessible for the entire pilot project.

However, WPO data under the category "job safety briefing" subheading of "two way dialogue" (see appendix A), shows a marked decline from the pre-intervention to the post-intervention period. This decline in the dialogue might be construed as a trust issue. Yet, the combination of the various measures suggests that rather than a "trust issue," it might reasonably be considered an "authority issue" (Bion, 1961) that is affecting the acceptance of WPO in the workplace. Exit interviews corroborate this conclusion.

While trust can be addressed effectively within work groups and between individuals, inter-organizational trust born out of authority issues is still problematic. For example, the initial trust necessary for Organization A, Organization B, and Management A to begin the WPO process was a local issue that can only be evaluated by participants at this particular location. It is not possible to generalize the level of trust exercised at this location to other locations. Individuals at various locations will confront different levels of inter-personal and inter-group trust. The conclusion here is that trust was asked for, trust was provided, and by and large the participants reported no violations of that trust.

Yet, by addressing the trust issue it was possible to clarify the authority concerns in the work place. This offers new direction for future researchers in WPO.

Does WPO interfere with normal performance of duties?

Organization A observer surveys showed initially 83% of respondents felt that little or no interference of their duties would occur from participating in WPO. Exit surveys confirmed the same results.

In addition, 50% of respondents from Organization B reported no interference with their normal duties, while 25% did not know if there was interference.

Generally, the time to record and forward observations is minimal. The actual observations themselves are a normal part of the duties of railroad workers. Compiling data and preparing reports constitutes a donation of time to the railroad approximating 2 hours per week over the course of the pilot project.

Overall, there is no evidence to support the supposition that WPO interferes with the performance of workers normal duties.

Why should workers perform this traditional management function?

The question, as framed for the pilot project at the outset, partially supports a conclusion of this project: authority is a major concern in the railroad industry. Beyond this assertion however, a nearly 22 percentage point difference was reported between Management A's experience of the work place and Organization A's experience of the workplace. This experiential difference helps to explain conflict within the railroad industry. Organization A, Organization B, and Management A agreed in the pilot project that worker safety would benefit from 95% compliance with best practice definitions. Further, Organization A, Organization B, and Management A agreed that performing best practice at 68-73% was an unacceptable level of risk to workers. The process of documenting rationally the experience, as provided by WPO, serves to align the experiences of the various groups and individuals within the work place.

Understanding the safety process in the railroad industry from a group perspective serves to illustrate the importance of rationalizing intra-work group experience between groups in an organization. The boundaries of a group (Rice, 1975), serve to contain and safeguard the beliefs, emotions, and experiences of a work group. Since information tends to flow easier between group members with common experience, the advocacy of

the group as an emergent product of the group experience tends to be self evident to group members. For example, Organization A experienced the WPO results as a self evident confirmation of a shared group experience.

However, Organization B members denied the level of "at risk" behavior documented by Organization A. Organization B alluded to the broader (authority) issues in the industry such as worker affiliation, remote control implementation, and experiential differences. The permeability of the boundary (Stevens-Long, 1993) between Organization A and Organization B served to discount the results of WPO.

Management A reported the difference documented by WPO between Organization A and Management A experience of the workplace was expected. However, the magnitude of the difference provided impetus for Management A to consider the rigidity of boundaries (Stevens-Long, 1993) within the workplace. Management A did not acknowledge the significance of boundaries between Organization A, Organization B, and Management A at the outset. The data served to highlight differences in a quantitative manner, providing a framework to foster permeability in the boundaries (Stevens-Long, 1993; Ricci, 1997). It is not possible to address boundary permeability without first acknowledging those boundaries.

As example of the importance to railroad safety of boundary permeability consider a not un-heard of experience of two trains colliding while shoving into a diverging track. The person(s) protecting the movement realize at the last minute that a collision is imminent and jump(s) from the moving train nearly avoiding a fatal experience. The trains get stopped and damage is minimal at perhaps $3000.00. What are the experiences? For the individual and his/her immediate work group within

Organization A and/or Organization B the experience is a near death experience. For Management A, insulated from the full experience by the multiple boundaries surrounding the experience, the incident reflects a minimal violation of existing best practice procedures. For Government agencies (i.e. FRA), another boundary exists that only identifies operating failures that exceed $6700.00, so by definition nothing happened. Thus, the same experience, when evaluated by 3 different groups (Labor/Management/Government) runs a spectrum from a near death experience to nothing is happening. Conflict within the industry may be understood within this experiential spectrum.

Using the rationalization process suggested by WPO serves to effectively transfer information across the boundaries while at the same time respecting and honoring those boundaries. This does not address information flow between regulatory agencies and the actual work experience, however. That issue is beyond the scope of this pilot project.

Overcoming denial in the workplace can be achieved by increasing "buy in" to the process. Cooperation, born out of trust, would benefit from attention to resolving the numerous issues festering in the industry. In order to address the buy in issue however, attention to group boundaries must be observed.

While authority has been noted as a stumbling block in this pilot project, authority is an emergent property of group process (Ricci, 1997). Rather than getting lost in the abyss of authority, this pilot project focused on boundaries. Specifically, boundary attention in the search for a definition of cross craft observation serves as one example of attending to boundary permeability without confronting head on the more difficult emergent variable: authority.

This is not without its own difficulties. From exit interviews, the most frequent negative experience associated with WPO by both Organization A and Management A was the actions and opinions voiced by Organization B. Fully addressing the concerns of Organization B was a frequent suggestion voiced by both Organization A and Management A.

This pilot project has served to evaluate a new safety initiative in the railroad industry. Information from the research provides a basis for other work-groups within the industry to formulate reasoned decisions about participating in future WPO initiatives. Along those lines, recommendations are offered below.

Recommendations

For those work groups considering a WPO process, participants within the pilot project compiled recommendations beyond the conclusions stated above.

(1) A "How to…" handbook of sorts that may provide information and useful ideas to prompt the coordinator/observer/participants along the way, would be a useful tool that would support the WPO effort.

(2) Producing and coordinating educational materials focused on the applicable work practices for use in the WPO workplace would help to support the intervention process. This would make the intervention more of an iterative change process that did not rely on a particular, one time, intervention to change behavior in the work place.

(3) Consider instituting a reward or acknowledgement process that supports the WPO effort commensurate with its importance to improving work place safety. Attention to boundaries is important here, though they should not be considered insurmountable.

(4) Work to increase "buy in" or acceptance of the process among all groups affected by WPO. General efforts to make the workplace less divisive and more inclusive would support this recommendation. Addressing long standing issues within the workplace becomes an organic element of increased cooperation. Ultimately, workplace acceptance and issue resolution may become a complimentary process, each action benefiting from attention to the other.

(5) Future research might refine the accident, incident and injury frequency ration used in this pilot project to include a severity ratio and a person-hours worked.

These would serve to document the assumptions used in deciding which work practices should be observed for maximum safety improvement.

Available Resources

For a resource about the particular research discussed in this paper contact:

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For a resource about creating change within work groups and organizations

contact:

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Silverdale, WA 98383
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Appendix A

Pre- Intervention Data			Work Practice	Post-Intervention Data		
Total Observations	Percent Safe	Percent At Risk	Shoving Cars	Total Observations	Percent Safe	Percent At Risk
45	73.33%	26.67%	Crew member is either riding on or in front of the movement to provide protection	50	90.00%	10.00%
40	85.00%	15.00%	Visual inspection of track before giving instructions to shove cars	47	89.36%	10.64%
41	85.37%	14.63%	Engineer knows who is protection the point and how, before moving	51	96.08%	3.92%
57	63.16%	36.84%	Distance of movement is specified	50	90.00%	10.00%
62	66.13%	33.87%	Once Moving, are additional instructions given within half the distance of the previous instructions	51	88.24%	11.76%
36	97.22%	2.78%	Movement is stopped if additional instructions are not received within half the distance previously specified	52	90.38%	9.62%
6	100.00%	0.00%	On main track, not exceeds 20 mph	0		
15	80.00%	20.00%	Utility employees are properly attached	6	100.00%	0.00%
302	76.82%	23.18%	Totals	307	90.88%	9.12%

Comments

Pre- Intervention Data			**Work Practice**	**Post-Intervention Data**		
Total Observations	Percent Safe	Percent At Risk	Getting On and Off Equipment	Total Observations	Percent Safe	Percent At Risk
50	64.00%	36.00%	Equipment comes to a complete stop before getting on or off	43	86.05%	13.95%
38	63.16%	36.84%	Inspects equipment before getting on	43	97.67%	2.33%
46	65.22%	34.78%	Maintains three-point contact at all times while mounting or dismounting	44	90.91%	9.09%
41	56.10%	43.90%	Before getting off, checks touchdown point to be sure no hazards are present	41	87.80%	12.20%
37	75.68%	24.32%	Faces equipment when dismounting	46	82.61%	17.39%
36	100.00%	0.00%	Uses the side ladder when dismounting	45	100.00%	0.00%
39	97.44%	2.56%	Verifies there is no moving equipment on adjacent track before dismounting	47	95.74%	4.26%
33	75.76%	24.24%	Unloads & loads grips without straps & other objects before getting on or off	45	93.33%	6.67%
320	73.75%	26.25%	Totals	354	91.81%	8.19%

Comments

Pre- Intervention Data			**Work Practice**	**Post-Intervention Data**		
Total Observations	Percent Safe	Percent At Risk	Going In Between Equipment	Total Observations	Percent Safe	Percent At Risk
59	49.15%	50.85%	Separate Cars by 50 feet	54	68.52%	31.48%
60	66.67%	33.33%	Wait for equipment to stop	52	88.46%	11.54%
51	68.63%	31.37%	Wait for slack to adjust	52	86.54%	13.46%
71	80.28%	19.72%	Notifies engineer by radio or hand signal that crew member wants to go in between	52	76.92%	23.08%
1	100.00%	0.00%	Notifies others who could affect movement (yardmaster) if not attached to locomotive	2	50.00%	50.00%
67	89.55%	10.45%	Engineer centers reverser & sets brakes	49	93.88%	6.12%
66	92.42%	7.58%	Engineer acknowledges by radio to radio request, by whistle for hand signal	49	95.92%	4.08%
69	75.36%	24.64%	Wait for Engineer acknowledgement	45	93.33%	6.67%
67	71.64%	28.36%	Completely clear before reporting clear	51	90.20%	9.80%
444	75.45%	24.55%	Totals	406	86.21%	13.79%

Comments

Pre- Intervention Data			**Work Practice**	**Post-Intervention Data**		
Total Observations	Percent Safe	Percent At Risk	Two Crews working in the Same Yard	Total Observations	Percent Safe	Percent At Risk
23	95.65%	4.35%	Knowledge of other crew working in the same yard at the same time	13	84.62%	15.38%
23	65.22%	34.78%	Knowledge of other crew's engine ID No.	11	45.45%	54.55%
25	48.00%	52.00%	Knowledge of other crew's radio channel	12	50.00%	50.00%
24	16.67%	83.33%	JSB conducted with both crew and Yardmaster/supervisor	11	27.27%	72.73%
26	61.54%	38.46%	Direct communication Established between all crew members involved	11	81.82%	18.18%
27	92.59%	7.41%	Clear understanding of hand/lantern signals being giving and to whom	10	90.00%	10.00%
22	81.82%	18.18%	Understanding of tracks & equip. involved	13	84.62%	15.38%
27	100.00%	0.00%	Crew members in position to watch movement and protect adjacent tracks	13	92.31%	7.69%
197	70.56%	29.44%	Totals	94	70.21%	29.79%

Comments

Pre- Intervention Data			**Work Practice**	**Post-Intervention Data**		
Total Observations	**Percent Safe**	**Percent At Risk**	**Job Safety Briefing**	**Total Observations**	**Percent Safe**	**Percent At Risk**
29	41.38%	58.62%	Identify existing & potential Hazards	47	93.62%	6.38%
22	45.45%	54.55%	Are there alerts/bulletins related to task	45	91.11%	8.89%
18	66.67%	33.33%	Work assigned based on abilities, experience and equipment	44	95.45%	4.55%
24	87.50%	12.50%	Two way dialogue	48	70.83%	29.17%
26	38.46%	61.54%	Discuss ways to eliminate or protect against risks or hazards	45	80.00%	20.00%
29	62.07%	37.93%	Everyone understands the task and what part is their responsibility	47	72.34%	27.66%
20	85.00%	15.00%	Everyone understands what to do in an emergency	45	88.89%	11.11%
24	87.50%	12.50%	Everyone has clear understanding of what empowerment means	47	93.62%	6.38%
192	63.02%	36.98%	Totals	368	85.60%	14.40%

Comments

Pre- Intervention Data			**Work Practice**	**Post-Intervention Data**		
Total Observations	Percent Safe	Percent At Risk	Tying Ratchet Type Handbrake	Total Observations	Percent Safe	Percent At Risk
38	50.00%	50.00%	Visually inspects the platform, chains, and surroundings for damage	50	90.00%	10.00%
42	95.24%	4.76%	Positions body close to the brake handle	47	100.00%	0.00%
42	100.00%	0.00%	Keeps body out from under handle	46	100.00%	0.00%
46	82.61%	17.39%	Does not stretch for handle	47	97.87%	2.13%
42	76.19%	23.81%	Uses good body mechanics to operate the brake. Uses fluid motion, does not jerk, does not over tighten	48	93.75%	6.25%
39	41.03%	58.97%	Checks to ensure brake chain is tight and there are no kinks	47	87.23%	12.77%
249	75.10%	24.90%	Totals	285	94.74%	5.26%

Comments

Pre- Intervention Data			**Work Practice**	**Post-Intervention Data**		
Total Observations	**Percent Safe**	**Percent At Risk**	**Radio Communications**	**Total Observations**	**Percent Safe**	**Percent At Risk**
51	72.55%	27.45%	Before transmitting, make sure channel is not being used	54	81.48%	18.52%
56	87.50%	12.50%	Gives required identification, railroad initials, station location, train, engine number, or mobile unit.	49	81.63%	18.37%
51	58.82%	41.18%	Wait for acknowledgement.	52	75.00%	25.00%
37	83.78%	16.22%	Received transmission is repeated. (except switching)	10	80.00%	20.00%
34	100.00%	0.00%	Communication not understood is not acted upon.	52	98.08%	1.92%
44	54.55%	45.45%	Base stations acknowledge transmissions	41	82.93%	17.07%
61	59.02%	40.98%	Direction and distance is specified	52	90.38%	9.62%
32	46.88%	53.13%	"Over" or "Out" used. (except switching)	6	50.00%	50.00%
366	69.95%	30.05%	Totals	316	84.18%	15.82%

Comments

Pre- Intervention Data			Work Practice	Post-Intervention Data		
Total Observations	**Percent Safe**	**Percent At Risk**	**Walking**	**Total Observations**	**Percent Safe**	**Percent At Risk**
38	65.79%	34.21%	Walking slowly & under control, focusing attention to the walking surface	53	84.91%	15.09%
45	66.67%	33.33%	Avoid walking and reading at same time	52	84.62%	15.38%
33	72.73%	27.27%	Avoid walking & inspecting equipment at the same time	49	87.76%	12.24%
56	76.79%	23.21%	Avoid walking backwards	48	95.83%	4.17%
21	100.00%	0.00%	Inspect work area or walkway prior to using for the first time	48	97.92%	2.08%
45	77.78%	22.22%	If crossing over the track around cars left standing, allow 25ft of clearance	50	92.00%	8.00%
34	97.06%	2.94%	Visually verifies the location of moving equipment & checks in both directions before fouling or crossing tracks	52	96.15%	3.85%
21	47.62%	52.38%	Use of light to illuminate walking path	23	73.91%	26.09%
293	75.43%	24.57%	Totals	375	90.13%	9.87%

Comments

Total Observations Averaged Across Work Practices

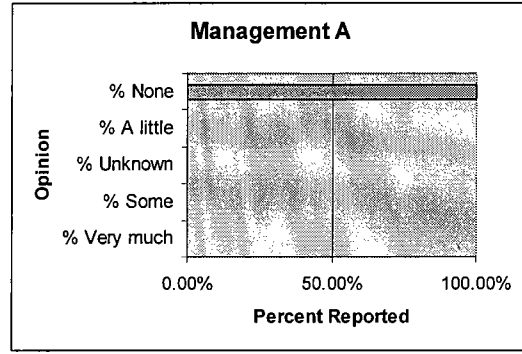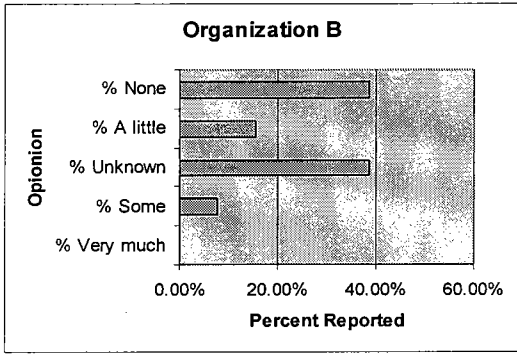| **Pre- Intervention Data**				**Post-Intervention Data**		
Observations	safe /	at risk		Observations	safe /	at risk
2363	73.09%	26.91%	**TOTALS**	2505	88.18%	11.82%

38

Appendix B

WPO Attitude Surveys

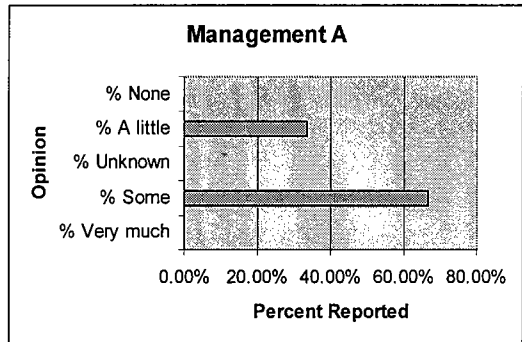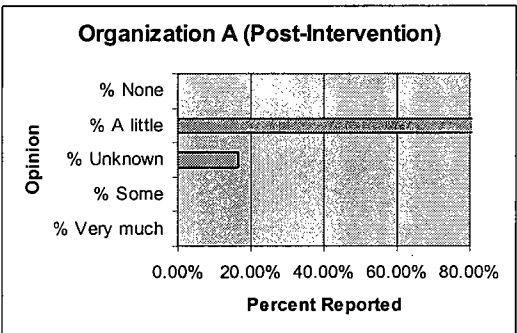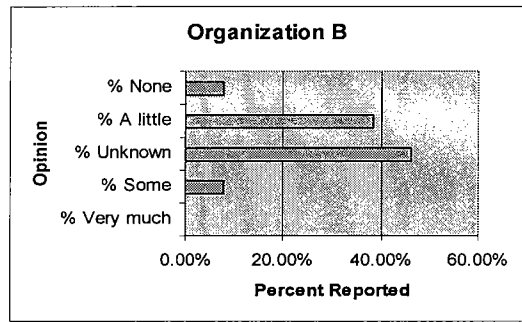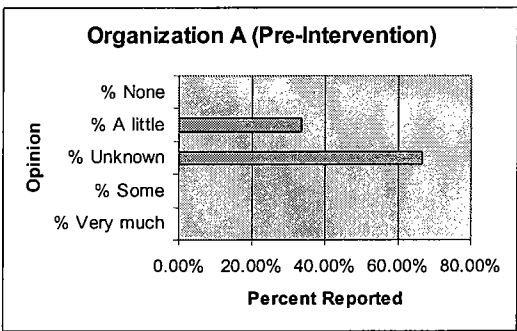How much do you think WPO interferes with the performance of your duties in the workplace?

Organization A

Opinion / Percent Reported

% None, % A little, % Unknown, % Some, % Very much

0.00% 20.00% 40.00% 60.00%

Organization B

Opinion / Percent Reported

% None, % A little, % Unknown, % Some, % Very much

0.00% 20.00% 40.00% 60.00%

Organization A (Post-Intervention)

Opinion / Percent Reported

% None, % A little, % Unknown, % Some, % Very much

0.00% 20.00% 40.00% 60.00%

Management A

Opinion / Percent Reported

% None, % A little, % Unknown, % Some, % Very much

0.00% 50.00% 100.00%

How much trust do you feel is violated by addressing safety issues this way in the work place?

Organization A (Pre-intervention)

Opinion / Percent Reported

% None, % A little, % Unknown, % Some, % Very much

0.00% 20.00% 40.00% 60.00%

Organization A (Post Intervention)

Opinion / Percent Reported

% None, % A little, % Unknown, % Some, % Very much
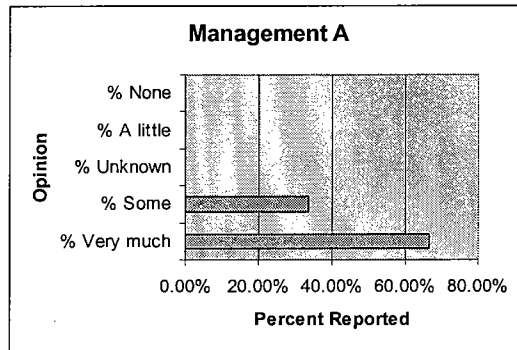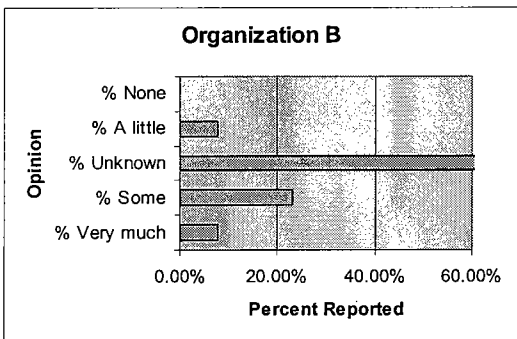
0.00% 20.00% 40.00% 60.00%

Organization B

Management A
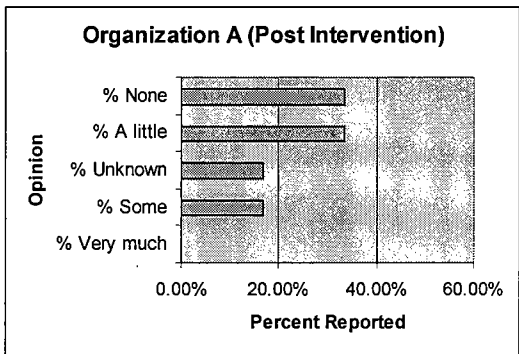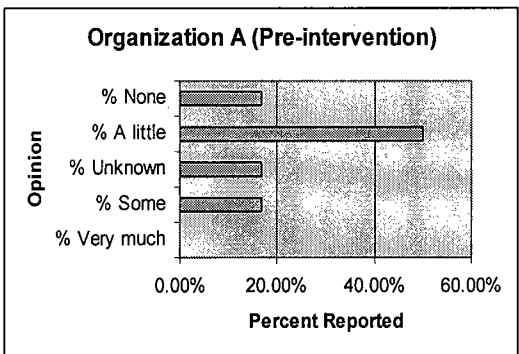
How much time do you feel was used by participating in the WPO process?

Organization A (Pre-Intervention)

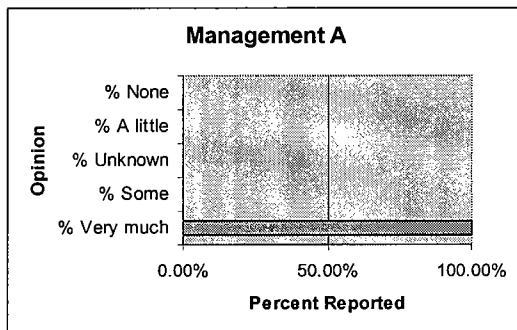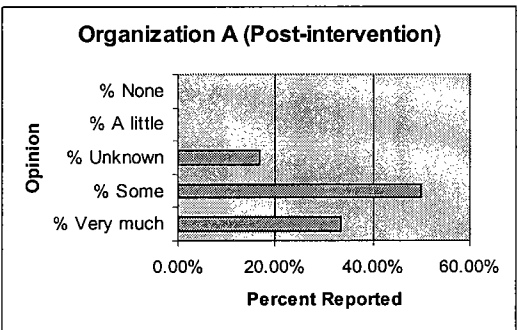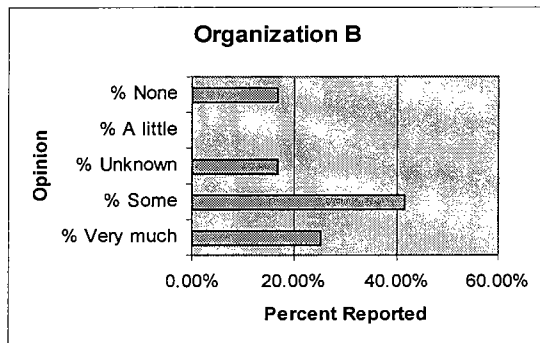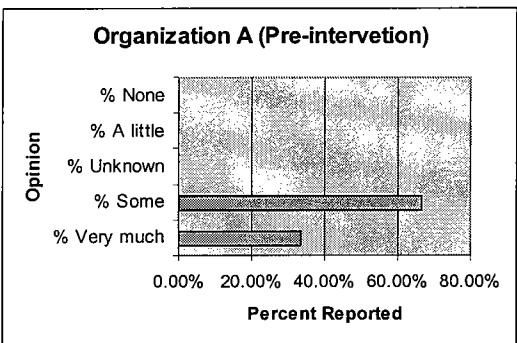Organization B

Organization A (Post-Intervention)

Management A

How much will safety improve as a result of WPO?

Organization A (Pre-Intervention)

Organization A (Post-Intervention)

Organization B

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
0.00% 20.00% 40.00% 60.00%

Management A

Opinion / *Percent Reported*

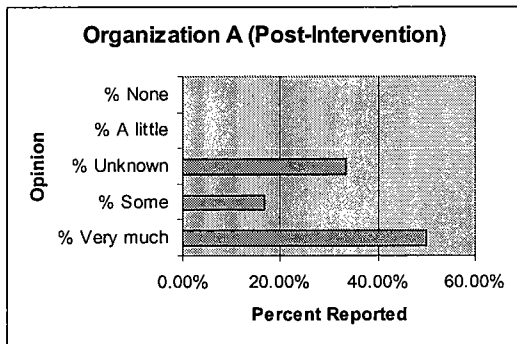(% None, % A little, % Unknown, % Some, % Very much)
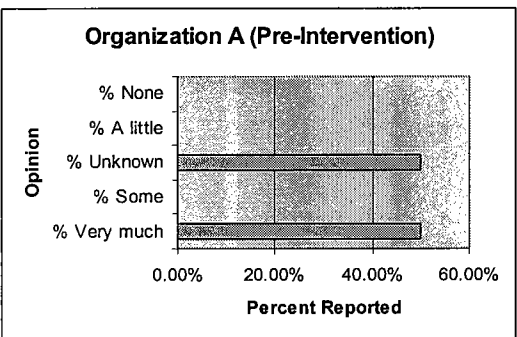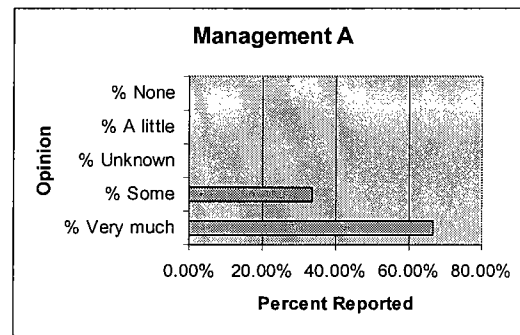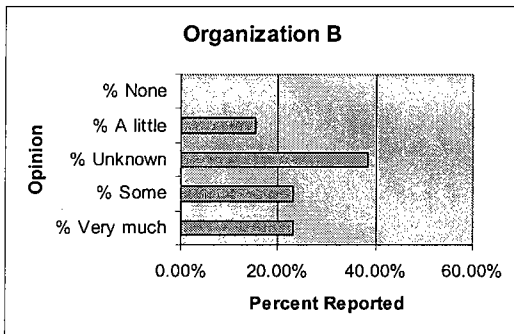0.00% 20.00% 40.00% 60.00% 80.00%
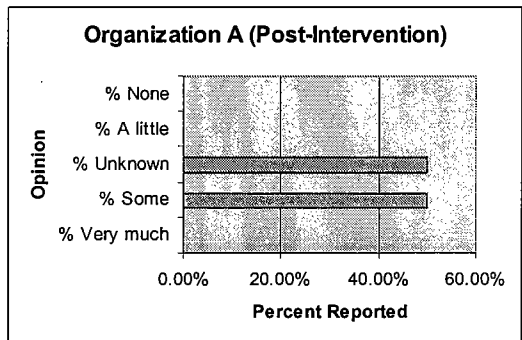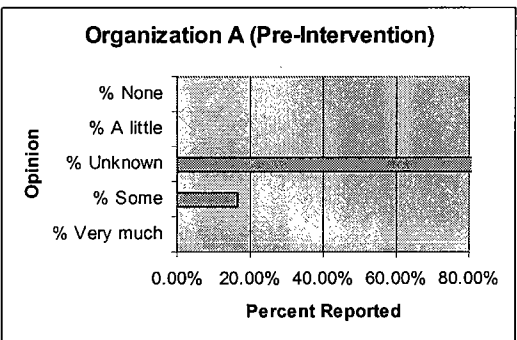
How much do you feel WPO is an important and necessary effort to try to improve railroad safety?

Organization A (Pre-intervetion)

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
0.00% 20.00% 40.00% 60.00% 80.00%

Organization B

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
0.00% 20.00% 40.00% 60.00%

Organization A (Post-intervention)

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
0.00% 20.00% 40.00% 60.00%

Management A

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
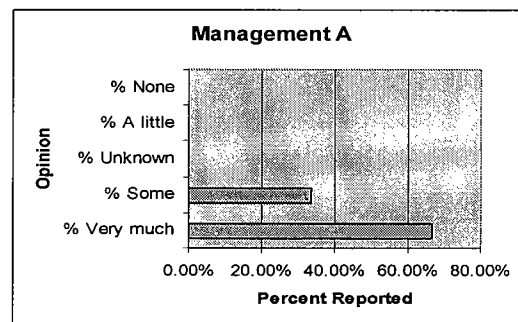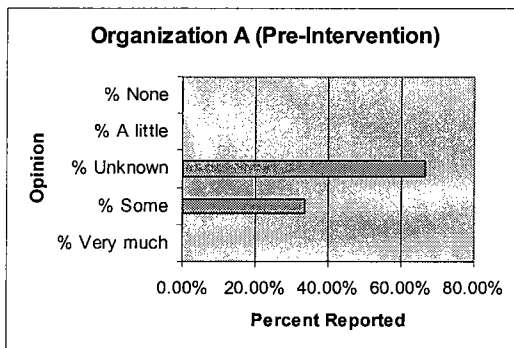0.00% 50.00% 100.00%

How much do you feel the WPO process includes the input of the workers?

Organization A (Pre-Intervention)

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
0.00% 20.00% 40.00% 60.00%

Organization A (Post-Intervention)

Opinion / *Percent Reported*

(% None, % A little, % Unknown, % Some, % Very much)
0.00% 20.00% 40.00% 60.00%

Organization B

Management A

How much do you feel that employee/management safety efforts like WPO improve safety in the work place?

Organization A (Pre-Intervention)

Organization B

Organization A (Post-Intervention)

Management A
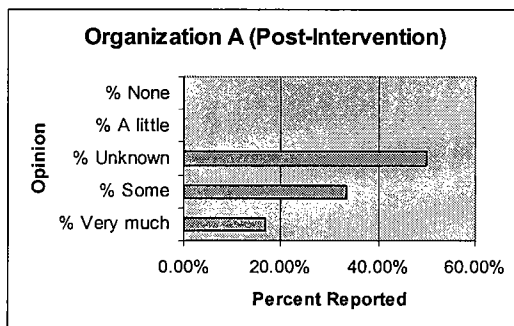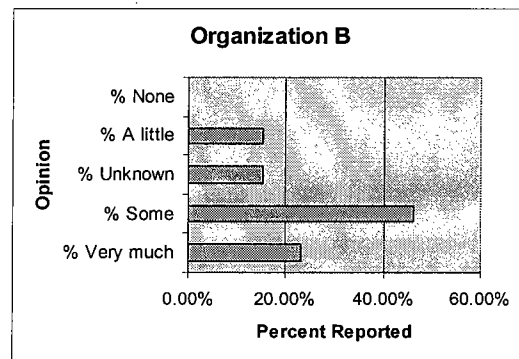
Note: Organization A respondents returned 90% of surveys. Pre-intervention surveys were completed at the beginning of the pilot project. Post intervention surveys were completed at the conclusion of the pilot project.

Organization B respondents returned 29.55% of surveys. Organization B surveys were completed at the intervention (mid-point) of the pilot project.

Management A respondents returned 100% of surveys. Management surveys were completed at the conclusion of the pilot project.