Loss Education to Reduce Construction – Related Injuries

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List of Abbreviations

DPT	Delayed post-test
DWC	Department of Worker Claims
EMOD	Experience Modifier
FSI	Farm stress injury model
IPT	Immediate post-test
KEMI	Kentucky Employers' Mutual Insurance Company
KIPRC	Kentucky Injury Prevention and Research Center
PAF	Principle axis factoring
PRE	Pre-test
RPT	Retrospective pre-test
VAS	Visual analogue scale

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Abstract

Background: The goal of this study was to develop and test the effectiveness of a safety training intervention for employees, supervisors, and owners of small construction firms (≤ 10 employees) in Kentucky. The project involved a partnership between the Kentucky Injury Prevention & Research Center (KIPRC) and Kentucky Employers' Mutual Insurance (KEMI). The project was in two phases over a three year interval. Phase 1 (Year 1) consisted of intervention development and authentication activities. Phase 2 (Years 2 and 3) consisted of intervention dissemination and evaluation.

The intervention consisted of a series of six reality-based latent-image, narrative simulation exercises targeted to the prevention of falls or back injuries. They were designed to emphasize the economic impact of injuries and benefits of individual and organizational injury prevention strategies. The simulations, developed in Year 1, were based upon findings from a series of focus groups of small construction company owners and employees held in each of eight regions in Kentucky. In each year of Phase 2, three of the simulations were administered.

Design: The study design used to test the intervention in Phase 2 was quasi-experimental. In each year of Phase 2, intervention participants took pre-test (PRE) and immediate post-test (IPT) measures concurrently with the simulations. Delayed post-test (DPT) and concurrent retrospective pre-test (RPT) measures were administered to intervention participants three to four months after the intervention. In Year 2, the intervention group was subdivided into participants who attended a group administration meeting and participants who completed simulations at home. Control group subjects took concurrent PRE and RPT measures. Hypotheses tested were:

(1) Workers who participate in a training program consisting of six simulations (3 for fall prevention and 3 for back injury prevention) experience fewer injuries and submit fewer worker compensation claims than those workers who do not participate.
(2) Worker compensation claims filed by Kentucky Employers Mutual Insurance (KEMI) companies that participate in a simulation training program differ significantly from claims submitted by non-participating KEMI companies and companies not insured through KEMI.

Additional research aims included:

(3) Examining the differences in safety climate, safety attitude, and self-efficacy among the home-administration and control groups; and
(4) Exploring reasons for non-participation in a safety training program.

Sample: The intervention group consisted of owner-operators, supervisory personnel, and employees. In Year 2, the treatment was stratified into home or group administration, but participation in group sessions was poor (n = 38). Therefore, in Year 3, group administration ceased, while home administration was maintained (n = 260 for Years 2 and 3). In both years, a no-treatment control group (n = 95 for Years 2 and 3) consisted entirely of owner-operators or supervisory personnel.

Results: Participant and control owners/supervisors were highly experienced and employed full time. The mean years of construction experience among non-supervisory employees was at least 9 years in both years of Phase 2. Control subjects were somewhat more experienced in

construction and put in longer hours than owners/supervisors in the intervention group, but both groups were highly experienced in construction (Means ≥ 18 years) and worked full-time. There were no differences between intervention participants and controls on a pre-test measure of safety climate in either year. In both Year 2 and Year 3, simulation performance scores were relatively high (overall means ≥ 79% of maximum), and simulation evaluations were generally favorable (overall means ≥ 82% of maximum). In Year 2, there was no significant difference between PRE and DPT scores on the safety climate measure. However, scores on the RPT (a mean of 2 items) were significantly lower than the scores on the corresponding PRE and DPT items. This suggested a possible response-shift (i.e., the intervention may have influenced subjective calibration judgments with respect to the measure being used). In Year 3, using a revised and more reliable safety climate measure (10 items; $\alpha = .89$) there was no significant difference between PRE and RPT or PRE and DPT measures in the intervention group.

In terms of claims experience, between the inception of KEMI in 1995 and May 1999, 61 claims of any type occurred in 19 of 147 companies (13%) who participated in the intervention in Year 2 or Year 3. Of those 61 claims, 7 (from 3 companies) were for back injuries and 12 (from 8 companies) were claims resulting from falls. In the control group, over the same interval, 82 claims of any type occurred among 58 of 389 companies (15%). Of those 82 claims, 17 were for back injuries (16 companies) and 25 were fall-related (22 companies). There were not enough cases for meaningful inferential analysis of a treatment effect on claims. There were no significant differences in the number or cost of claims between intervention participants and controls over this claims history period. It also turned out that there was no feasible way to link Kentucky Department for Workers Claims insurer data to individual claims. Therefore, comparisons between KEMI and non-KEMI claims could not be made.

The most frequently reported reasons for not participating in Years 2 and 3 were: "Time involved too much for me"; and "Company already has good safety record". The most frequently selected reasons for participating were "Will get insurance discount" (80%, $n = 123$) and "Safety is a priority for our company" (68%, $n = 104$).

Conclusions: In the small construction outfits whose owners agreed to participate or were willing to serve as controls, safety climate is a valued and stable characteristic. Despite not showing an impact on safety climate or claims, simulation evaluations suggested that participants found them realistic and worthwhile. Simulation exercises may provide a reinforcement of good safety practices rather than new knowledge or impetus for behavioral change in highly experienced workers. Claims experience was far less than expected. Smaller construction outfits may actually be safer overall than larger construction companies; despite being relatively less regulated.

Significant Findings

Phase 1 (Year 1): Development of the Intervention

Important behavioral risk factors for construction-related injuries identified in the focus group analysis were:

- being in a hurry;
- not paying attention to the task at hand (performing habitually or in a routinized manner);
- not sizing up a work situation accurately (e.g., the nature of a job and the adequacy of people and equipment available to get it done);
- not taking sufficient time to plan hazardous activities;
- clutter around the worksite;
- exercising poor judgement about people, situations, or the necessity for protective equipment;

The protective factors identified to prevent construction-related injuries were:

- pacing work and the rate at which new work is taken on;
- maintaining attention on the task at hand;
- planning and coordinating work activities;
- maintaining a clutter-free worksite;
- coaching co-workers or employees to do tasks safely;
- communicating consistently, through actions and words, that safety is valued (e.g., staying safe is as important as getting the job done).

Injury events related by focus group participants involved workers who were experienced as well as those who were less experienced. Therefore, however desirable experience may be in general, it was not sufficient protection against injury. The importance of a good reputation for quality craftsmanship was mentioned repeatedly. It was commonly asserted that a clutter-free worksite was a sign that workers cared about the quality of their work. It was also suggested in several groups that one cannot do good quality work if one is working at an unsafe pace. ***This suggests that combining messages about workplace safety with appeals to pride in craftsmanship may be a worthwhile approach in safety interventions.***

Economic factors were a major concern (e.g. competition, productivity costs of injury, insurance costs and abuse of the workers' compensation system), but the focus group data suggested that the relationship of economic factors to injury was indirect, primarily mediated by the degree to which those factors contributed to working in unsafe conditions, in an unsafe manner, or at an unsafe pace in order to maintain productivity.

Phase 2 (Year 2): Dissemination and Evaluation of the Intervention

There were no substantial differences in simulation performance or evaluation scores based upon whether participants were owner-operators or non-supervisory employees, a finding which mirrored findings in the focus groups of Phase 1. Evidently, in this population (at least in companies whose owners are willing to participate in a safety program), values with respect to safety issues appear to be reasonably congruent between workers and management. Evaluations

of the simulations were generally favorable, especially with respect to exercise realism (which also suggests that the results of the focus group analysis that were applied to the simulations had reasonable validity) and exercise quality. Lower evaluation scores for applicability to work may have been an effect of including heterogeneous trades and work types in the sample.

Demographic differences between intervention participants and controls were largely attributable to the control group consisting only of owner-operators (i.e., differences were relatively minor between owner-operators in the intervention and control groups). There were no substantial differences on the safety climate PRE measure between intervention participants and controls. Within the intervention group, there was no significant difference between PRE and DPT safety climate scores. However, there was evidence that RPT scores were lower than PRE scores. This was consistent with what has been termed beta change (Golembiewski, Billinsgley, & Yeager, 1976) or a response-shift (Howard, 1980), that is, a change in subjective judgments about the range and gradations of a scale in virtue of participation in an intervention. In essence, intervention participants may have been more self-critical about safety climate after participating than they had been before. There was no such change among controls. Among intervention participants, there also was evidence that DPT safety climate scores were significantly higher than the concurrently obtained RPT scores. Based on findings in Year 2, only the safety climate items that had the best psychometric performance were retained for use in Year 3.

Phase 2 (Year 3): Dissemination and Evaluation of the Intervention

Demographic characteristics of intervention and control subjects were substantially similar to the Year 2 sample. Simulation performance and evaluation scores were marginally higher in Year 3 compared to Year 2. As in Year 2, simulation realism and quality were rated somewhat higher than applicability to work. There was no difference between intervention participants and controls in the safety climate PRE measure. As in Year 2, among intervention participants, there was no significant difference between PRE and DPT safety climate scores. However, unlike Year 2, when a full RPT of all safety climate items was conducted in Year 3, there was no difference between RPT and PRE scores, hence no evidence of beta change/response-shift when a more reliable measure was used. ***Findings suggest that safety climate in this population (at least in companies whose owners are disposed to participate in safety research) is a relatively stable characteristic that might be more appropriate as an independent variable instead of a dependent variable.***

Injury claims were examined for both treatment and control companies over approximately 4-years (from inception of KEMI in 1995 until May 1999). This time period was selected because too few claims were present to allow examination of differences pre-post intervention. ***There were no significant differences in the number or cost of claims between intervention and control participants. Claims were far less than expected, implying that small construction outfits may actually be safer overall than larger construction companies.***

Usefulness of Findings

Phase 1 (Year 1): Development of the Intervention

A number of the focus group findings have potential usefulness in various contexts.

- Reputation

The importance of a good reputation for quality craftsmanship, and the relationship between poor quality work and hurry or pressure to complete a job, ***suggest that combining messages about workplace safety with appeals to pride in craftsmanship may be a worthwhile approach in designing safety interventions.***

- Clutter

The common assertion that a clutter-free worksite was a sign that workers and owners valued safety and the quality of their work ***suggests that worksite clutter (or its absence) may be a behavioral marker of increased (or decreased) injury risk.***

- Economic Ramifications of Injury

Economic ramifications of injury can be communicated in a realistic and meaningful manner to justify the apparent costs of safety (see results in Years 2 and 3 on evaluation of the simulation exercises). For example, the quality of work is diminished and productivity suffers when one has to hire and train replacements. In addition, there may be damage to the company's reputation and credibility when quality suffers or work is delayed because of injury.

- Pacing Work

An unanticipated finding, supported in several of the focus groups, was that older, more experienced owners reported having learned over time to pace the rate at which they bid and take on new work. Some also reported cutting back on the size of their operations (e.g., the number of crews they typically ran). These owners also reported that cutting back to a more manageable size and pace of operations had not hurt their economic bottom-line at all while it substantially improved safety, quality, reduced stress, and enhanced their sense of control over their business. ***Thus, it may be the case that construction company owners when they are first going into business for themselves may be especially at risk for overextending themselves and their operations in a manner that heightens injury risk. It may be that targeting interventions to younger less-experienced owners, in particular emphasizing their critical role in creating a positive safety climate and determining the overall pace of work, would be a worthwhile approach to take in future research.***

- Coaching

Because the companies in the study sample had few employees, they typically did not have a formal safety training program. Instead, the importance of taking a personal interest in workers' welfare and performance was emphasized. In particular, coaching employees in workplace safety was commonly reported. Coaching takes several forms: (a) hands-on training of inexperienced workers; (b) "buddying up" less experienced workers with more experienced workers; (c) admonishing more experienced workers when one sees them doing something unsafe; and (d) reminding all employees (particularly when time pressure is on) that safety and quality work are still of primary importance. ***Thus coaching should be stressed as an injury protective behavior***

that is affordable and available in construction companies, even with few employees and no formal safety training programs.

- Work Experience

Experience is a desirable and valued characteristic in construction workers. However, upon analyzing focus group participants' stories about injuries to themselves or that they had witnessed, experienced workers were involved in as many of these accounts as inexperienced workers. ***Therefore, with respect to injury prevention, experience per se may be less critical than motivational factors (e.g., loyalty to the company and co-workers, willingness to learn and follow instructions) or behaviors (e.g., pacing work, planning, sizing up a job before starting, coaching, and maintaining a clutter-free work zone).***

These themes were supported in all or nearly all groups despite the diversity of trades in each group. This suggested that one intervention might be effective across trades. However, this lack of specificity may discourage initial participation in safety training if the user does not perceive that the intervention is directed toward his or her trade.

Traditional safety approaches have focused on increasing safety practices or decreasing safety demand by a combination of regulation, engineering controls, and training. ***The focus group findings suggested that interventions that focus on safety climate and cognitive engagement with work may be perceived as more acceptable and realistic as an approach to preventing injuries in small, self-employed, and relatively unregulated companies.***

Phase 2 (Years 2 and 3): Dissemination and Evaluation of the Intervention

- Safety Climate

In Year 2, the dimensions that we set out to measure as dependent variables at pre-test, immediate and delayed post-tests, and the retrospective pre-test were Safety Climate, Safety Beliefs, and Self-efficacy. However, item and psychometric analyses suggested that our questionnaire essentially measured a positive and negative pole of a single construct, Safety Climate. There was some evidence that at least some aspects of Self-efficacy might be subsumed under the positive pole of Safety Climate. From a theoretical perspective, this may imply that one element of a positive Safety Climate is a sense that one feels enabled, empowered, or permitted to take effective action to enhance workplace safety for oneself and co-workers. In contrast, none of the Safety Belief items added to the reliability or interpretability of the measure. Therefore, those items were dropped. The total score of the retained items were generally high, as were simulation performance and evaluation scores. As a result, going into Year 3, we had made substantial progress in developing a brief, reliable, and concurrently valid measure of safety climate. The reduced safety climate measure used in Year 3 had strong internal consistency and also appeared to be very stable from pre-test to delayed post-test. Using a full retrospective pre-test on this more reliable measure we did not find evidence of a response shift. This was in contrast to Year 2 when only a few items were used for this purpose. In addition to relatively high simulation and evaluation scores, we also found in Year 3 that workers' compensation claims were less than anticipated in the entire sampling frames for intervention and control companies. ***This suggests additional support for the concurrent validity of the safety climate measure.***

- Trade-Specific Interventions

As in Year 2, simulation performance scores were relatively high and evaluations generally positive. However, in both years of Phase 2, simulation realism and overall quality were rated higher than the applicability of the exercises to work. We believe this reflects the heterogeneity of work types represented in our sample. This has implications for future attempts to devise safety interventions aimed at small construction companies. ***It may be the case that interventions need to be more trade-specific.***

- Involvement in Safety Training

Intervention participation and follow-up rates were disappointingly low in both Year 2 and Year 3. ***Nevertheless, we found that home administration was more acceptable in this population than arranging for group sessions after work.*** By Year 3, we also found useful information about reasons for participation and non-participation. Specifically, we found that the incentive for participation (a discounted workers' compensation premium) was deemed satisfactory by those who participated and was not an issue for those who initially agreed to participate but ultimately did not. In addition, non-participants did not judge the quality or intent of the intervention materials adversely. The most common reason for not participating was simply that owners felt they were too busy. The second most common reason was that they felt they already ran a safe outfit. Of interest, the latter was also one of the most common reasons for participation. ***This suggests that company owners who express a willingness to participate in research already value safety. Whether or not they follow-through with participation may depend on a kind of cost-benefit judgment about the incremental benefit derived from participation versus the perceived costs in terms of time.***

- Safe Companies

Analysis of claims data did not suggest any difference in either year between companies who participated in the intervention and controls. However, claims experience (as number or cost) for the entire sampling frames from which both groups were drawn was far less than anticipated. This suggests that some of the positive characteristics that we identified in both phases of the study may indeed have a substantial impact on reducing injury (e.g., pacing work to maintain quality and safety, hands-on coaching, a high degree of owner commitment to safety, and a positive safety climate). We found little if any evidence, in either phase of the study, of any substantial divergence of opinion or values pertaining to safety between employees and management in our sample. In essence, among companies willing to participate in the study, we found a generally paternalistic approach to management that emphasizes personal day-to-day involvement of owners in the quality of work being performed and the safety of those doing the work. We also note that KEMI, although a relatively new company, has made a very strong, public, and customer-service commitment to promoting workplace safety for all companies it insures, regardless of industry. That claims experience was as low as we found it to be suggests that any or all of these factors may make a real difference in terms of improving workplace safety in small construction companies, and, perhaps, other small business operations.

Scientific Report

Specific Aims

This study used a pre-test/post-test design to test the effectiveness of a simulation training program in decreasing injuries, claims, and costs in small construction companies (defined as ten employees or less) who were insured by the Kentucky Employers Mutual Insurance (KEMI) company.

The original aims of the study were to discover if:

(1) Workers who participated in a training program consisting of six simulations (three for fall and three for back injury prevention) experienced fewer injuries and submitted fewer workers' compensation claims than those workers who did not participate.

(2) Workers who participated in simulations using a group administration format experienced fewer injuries and submit fewer workers' compensation claims than those workers who participated in a home administration.

(3) Workers' compensation claims filed by the KEMI companies that participated in a simulation training program differed significantly from claims submitted by non-participating KEMI companies and companies not insured through KEMI.

(4) Differences existed in safety climate, safety attitude, and self-efficacy among the group and home administration groups.

The study consisted of two phases. The simulation training program was developed in Phase 1 (Year 1) using focus groups, medical records from injury cases, and workers' compensation claims. In Phase 2 (Years 2 and 3), the interventions were evaluated. Aims one through four were modified during Year 2 for the following reasons:

(1) Attrition rates were higher than anticipated, limiting the number of companies who completed the simulation training program in both Year 2 and Year 3. Therefore, separate analyses were conducted for Year 2 and Year 3. In essence, this redefined participation as having completed three simulations in either year of Phase 2 rather than having completed all six over two years as originally proposed.

(2) Participation rates were poor in Year 2, especially for group administration. Therefore, group administration ceased after Year 2, and this specific aim was dropped. Limited formal testing of hypotheses associated with this aim, based upon Year 2 data only, was not possible due to small sample size. As a result of abandoning this aim, greater effort was devoted to development and testing of a brief, reliable and valid measure of safety climate.

(3) It turned out not to be possible to obtain claims data from the Kentucky Department of Workers Claims that were specific enough to identify individual claims by insurer. Therefore, specific aim 3 could not be tested.

(4) Theoretically, group administration was thought to improve self-efficacy greater than home administration because of group interaction and discussion about implementing safety behaviors may encourage personal action. Since group administration ceased, self-efficacy was not examined across groups. Safety climate (including safety attitude) was examined between intervention participants and controls.

Because of the participation problems in Year 2, an additional aim was generated:

(5) Explore reasons for non-participation in a safety training program. Accordingly, toward the end of Year 2, and more comprehensively in Year 3, attempts were made to survey company owner-operators (a) in the control group and (b) in the intervention sampling frame (primarily, those who had been invited to participate and requested intervention materials but who ultimately did not participate.

Background

The research team had conducted several studies using simulation exercises as a way of communicating the relationships between injury, stress, and economics based on the Farm Stress Injury (FSI) model (Appendix A) (Kidd, Cole, Isaacs, & Parshall, 1996; Kidd, Scharf, & Veazie, 1996). The FSI model was not formally tested in the current project. Rather it provided an initial foundation for the interview guide used in the Year 1 focus groups. The analysis of the focus group data was not directed by the model. Rather the amount and richness of discussion on various topics across groups provided the key concepts and behaviors used for identifying and relating themes.

Similarities between construction and agriculture provided the rationale for inquiry about economic issues and stress in the focus group interviews and for emphasizing the economic ramifications of injury in the simulation exercises. For example, both construction and agriculture involve a large number of self-employed individuals or small operations in terms of the number of employees. As with many small businesses, owners of small construction and farming operations value being their own boss, and work is often performed independently. Weather conditions may interfere with work completion. The nature of the work may expose the worker to a variety of hazards such as heights, structures, machinery, chemicals, and electricity. In addition, both agriculture and construction are industries with high injury rates.

At the time of project submission, no formal evaluation of injury-related outcomes of the simulation exercises had been conducted in the agricultural studies. Because narrative simulation exercises had been well received by the farming community, we assumed that the construction community would also respond enthusiastically.

As was true at the time of proposal submission, back and fall injuries still contribute to a great number of lost-work days in Kentucky. According to the Kentucky Labor Cabinet, in 1997 the construction industry recorded 619 fall and 832 back injuries resulting in lost work days. The disproportionate number of lost-work days attributed to work-related falls and back injuries provided a rationale for developing the simulation exercises to address work situations that increased susceptibility to these types of injuries.

The idea of testing the effectiveness of the simulation exercises in a group versus home setting came from discussion with KEMI. KEMI representatives thought that owners of small construction companies (originally defined by the research team as fewer than 10 employees)

would prefer an option of home study because they might not value safety training enough to allow time during the work day to be spent on training (e.g. it might be perceived as delaying completion of work they had contracted to perform).

Based on the diversity of work types performed in small construction outfits, and the input from our focus groups, we decided that cognitive engagement with work activities should be emphasized rather than psychomotor skills which vary from one trade to another. As we had previously found in small farming operations, construction workers in small companies know what is unsafe behavior, but they perform unsafely because of work demands. Prior to conducting the focus groups, it was not possible to determine which themes or issues should be stressed in the simulation exercises to prevent injuries in small construction companies. Based upon the focus group analysis, themes of sizing up work demands, coaching, communicating, cleaning up, pacing and planning work were emphasized in the simulation exercises.

Once the simulation exercises were developed to reinforce cognitive rather than psychomotor skills, it did not make sense to assess the absence or presence of behaviors that were not a part of the training. Therefore, on the advice of project consultants, we did not measure knowledge organization, cognitive strategies, automaticity, and compilation as originally proposed. These variables are more appropriate to measure when teaching psychomotor skills such as donning safety gear. We also did not measure transfer failure because it involves failure to perform a task according to the procedures taught during training (Clark, 1986).

In addition to those variables, we proposed to measure safety climate, self-efficacy, and safety beliefs. This was supported by the focus group data indicating that organizational culture and climate in small construction companies differs from what has been described in the literature in relation to larger companies. For example, we found a high degree of professed paternalism by owners with parallel expectations of employee loyalty. In essence, owner-operators of small construction outfits professed to have a much more direct relationship with their employees than one typically finds in larger companies. Thus the goals, expectations, and commitments of the organization are communicated in a far more personalized manner than in large organizations. We were unable to find any existing measure of safety climate that reflected these kinds of issues. Therefore, we developed and tested a brief safety climate instrument that incorporated themes from the qualitative data analysis.

The idea of measuring change in self-efficacy was based on the principles of worker empowerment. The group format of administering the simulation exercises theoretically fosters group problem solving skills and improved communication among co-workers and management. It was hypothesized that those participating in the group format of the study would score higher in self-efficacy following the intervention than those participating in the home administration arm of the study. The team also hoped that if a positive change in self-efficacy were demonstrated, it would be possible in the future to encourage company owners to support safety training while "on the job". However, once the group administration was stopped, the rationale for measuring self-efficacy in Year 3 was no longer present. However, questionnaire items in Year 2 that were designed to measure self-efficacy (and which were judged by project consultants to be adequate for that purpose) did not correlate with a discrete factor in a factor analysis of all items. Rather, one self-efficacy item was clearly associated with items that measured positive elements of safety climate, and was retained on that basis. Two other self-efficacy items demonstrated indifferent psychometric performance and were dropped.

Phase 1 (Year 1): Development of the Simulation Training Program

Procedures

Nine focus groups were conducted in Year 1 of the study. However, one group was attended by only one participant so those data were disregarded. Seven of the remaining focus groups involved KEMI insured companies who agreed to participate in order to receive a discount on the company's workers' compensation insurance premium. The remaining focus group consisted exclusively of workers who had experienced an injury; members of this group were not insured by KEMI. All focus groups lasted from one and a half to two hours.

Focus group participants represented both general and special trades in construction, and included employees plus owner-operators (Table 1). As sampling procedures were developed we realized that it was not possible to determine from KEMI policies the number of employees for a given company. Thus, the premium on the policy was used to identify small construction companies. Policy premium is based on the amount of payroll and the type of job being conducted. Therefore, companies with fewer employees on the payroll have lower insurance premiums. The following steps were used in the sampling process for the groups that were drawn from KEMI-insured companies.

- KEMI premium records were reviewed to identify construction companies with premiums of $10,000 or less, reflecting fewer employees
- Companies were stratified geographically according to the eight Medicaid Managed Care Regions in the Commonwealth of Kentucky. A group was conducted in each of the regions to minimize travel for participants.
- Companies were randomly selected from this list to receive an invitation to a focus group in their region.
- After receiving a mailed invitation, companies were contacted by phone to answer questions about the session and to encourage participation.
- For the focus group of non-KEMI-insured injured workers, sampling involved a combination of purposive and snowball approaches.

Table 1. Focus group participation.

Focus Groups	# of Companies Invited	# of Companies Participating	# of Individuals Participating
Region 1	29	5	5
Region 2	29	8	10
Region 3	30	4	5
Region 4	30	11	17
Region 6	30	6	7
Region 7	30	7	7
Region 8	29	7	9
Injured worker	16	4	4
Total	223	52	64

Methods

Focus groups were moderated by a member of the research team using a semi-structured interview guide that incorporated concepts in the Farm Stress and Injury Model (Kidd, Scharf, & Veazie, 1996). Data were transcribed from audio tapes and analyzed using QSR NU*DIST (Rev. 4), a qualitative data analysis software program (Qualitative Solutions & Research Pty, Ltd., Melbourne, VI, AU). (The acronym NUD*IST stands for Non-numeric Unstructured Data Index Searching and Theorizing). Themes identified through analysis were reviewed by the research team and examined in terms of consistency across groups.

Three chiropractors were also interviewed individually to gain a better appreciation of long-term health consequences of less acute fall and back injuries. Medical records of persons receiving back and fall construction-related injuries were reviewed as well as injury claim records to identify realistic situations to use in developing the simulation exercises. Costs of medical care were also examined and integrated within the exercises.

Six simulation exercises were developed (three involving back injuries or prevention and three involving fall-related injuries or prevention), based upon all of the data sources described above. The simulations were authenticated in two additional focus groups. One group completed two of the fall-related injury simulation exercises and the other group completed two of the back injury simulation exercises. Participants completed an evaluation form in addition to discussing the simulations in a group format. The remaining two simulations were authenticated using home administration by those employed in a trade specific to the context of the simulations. Suggestions for revisions were incorporated. The revised simulation exercises were tested in Phase 2 (Years 2 and 3).

A general description of our analytical approaches to focus group analysis has been publication (Kidd & Parshall, 2000). A copy of that paper is included as an attachment to this report (Appendix B). Briefly, analysis involved a combination of broad contextual coding (e.g.,

extended segments of discourse) and fine-grained, line-by-line coding for specific content. Particular attention was given to content and contextual differences between general attributions (e.g., stated beliefs about the way people or situations are in general), and interactions among group members that revolved around narrative accounts of experienced or witnessed injuries (i.e., what dispositional, behavioral, and situational elements were alleged to be in play, or deemed most relevant to group members, when relating or responding to a story about how a particular person got injured).

Results

Focus Group Composition

A total of 63 individuals (5 Females) participated in the focus groups. Mean age of participants was 43 (SD = 11) years. Participants were highly experienced (Mean = 19, SD = 11, Range: 1 to 41 years). There was no significant difference across groups in mean age or experience. Approximately 80% (n = 48) worked in companies classified as special trades, and nearly 90% were non-union. Over 90% worked for companies with 10 or fewer employees. Slightly less than one-third (32%) reported ever having had an on the job injury; 20% indicated they currently suffered from effects of a prior work-related injury.

Major Themes Identified from Focus Groups

Important behavioral risk factors for construction-related injuries identified from the focus group analysis were:

- being in a hurry;
- not paying attention to the task at hand (performing in a routinized or habitual manner);
- not sizing up a work situation accurately (e.g., the nature of a job and the adequacy of people and equipment available to get it done);
- not taking sufficient time to plan hazardous activities;
- not checking equipment before using (e.g., a ladder or scaffold set up by someone else);
- clutter around the worksite; and
- exercising poor judgement about people, situations, or the necessity for protective equipment.

The protective factors identified to prevent construction-related injuries were:

- pacing work and the rate at which new work is bid and taken on;
- paying attention to the task at hand;
- sizing up work requirements and personnel;
- setting up equipment properly and checking before using;
- planning and coordinating work activities;
- maintaining a clutter-free worksite;
- coaching co-workers or employees to do tasks safely;
- communicating consistently, through actions and words, that safety is valued.

Examination of participants' narrative accounts of injury events (i.e., those that they had witnessed or been involved in) were scrutinized. These injury stories involved workers who were experienced and motivated as well as those who were less experienced or motivated. Thus experience and motivation alone were not sufficient protection against injury, despite the tendency of participants to assert that less experienced workers were more likely to get injured. In contrast, the cognitive and behavioral factors identified above as risk factors for injury were commonly involved in the injury stories, and very few of the protective factors were mentioned in those same accounts.

The importance of a good reputation for quality craftsmanship was mentioned repeatedly, and it was commonly asserted that working at a safe pace enhances the quality of work performed. For example, 'Craig' (all names are aliases), a highly experienced cabinet-maker described how he nearly amputated his thumb.

> CRAIG: I guess I know from experience. I think I do good work but I have been injured and that was from trying to do too much. That's why I've backed off the last three years, knowing that [that just doesn't help]. I cut a thumb off, just about, and it was from--I already had the wood through the saw and I was already thinking about what I was going to do next before I turned the saw off. And I still don't know how the thumb got in there, but it did.
> ....
> MODERATOR: Right. So that event was kind of important to you, saying, now, the reason this happened?
> CRAIG: Right, that's why I looked at that, why did this happen was because trying to do too much....
> MODERATOR: So you've kind of slowed it down a bit?
> CRAIG: Uh-huh (affirmative).
> MODERATOR: Are you making a lot less money or are you okay still?
> CRAIG: No. Well, it's almost if you hurry, you're going to mess up and if you slow it down you don't do as many mistakes, you don't have to redo and so you're back on track.
> CO-MODERATOR: So keeping a steady pace?
> CRAIG: Right. That's it, a steady pace. You've got to produce but you don't run over yourself trying to produce because then, that's where mistakes come in.
> CO-MODERATOR: So keeping a steady pace is actually--it's safer and more productive?
> CRAIG: Yes. In my line of work, or for me, (inaudible) a steady pace because usually I find the guy, usually he's trying to hurry. They'll cut it wrong or something instead of measuring twice, cut it one time and cut it wrong. Well, that material is wasted and then you've got to do it again anyway. Like he says, steady pace.
> CO-MODERATOR: Do other people here agree with that?
> ZACK: Yeah, I agree with that.
> ISRAEL: You can't do it all the time, but it's the best way to do it.

Economic factors were a major concern (e.g. competition, productivity costs of injury, insurance costs and abuse of the worker compensation system). The following exchange among a mason (Wyatt), concrete contractor (Upton), and heavy equipment operator (Yancey) illustrates the economic consequences of not controlling the pace at which work is bid.

> MODERATOR: ....Since taking your time to do a job well is also going to get it done safely, how does bidding work? I mean, do these people that are trying to do too much, you say they're either trying to live too high or work too cheap, are they bidding more work than they can do safely?
> WYATT: Probably, and I fell into that category up until about four years ago.
> MODERATOR: What made you change?
> UPTON: I did, too.
> WYATT: Old age. I got smarter. Used to, I'd stay booked up 10, 12 months in advance. I don't want that headache on me any more. If I stay booked up a month in advance, I'm tickled to death.
> UPTON: That's the way I like to stay, about four weeks.

WYATT: I don't want all the pressure and headaches. I'm trying to hurry up and get this job done so I can hurry up and get this job done so I can hurry up and get this one, I don't want that. If I want to take tomorrow off and go fishing, I'm going to do it.
YANCEY: But we work on the basis that if you want me on the job--and we do insulation, mechanical and industrial insulation--hey, you've got to, at least, got to tell me a week ahead of time you want me. I know where I'm going through the next week. And if you call me and say, I've got to have a man tomorrow, I say, I'm sorry. We'll be there--and give them a date next week, we'll be there. Now, you can count on us being there that day, but you cannot—and what you run into is people that you work for and they'll tell you--I think everybody will tell you--the people that you work for, if they're good contractors, they can tell you a week in advance.
UPTON: Wyatt, you're talking about staying booked a year and hammering it like you used to, I backed up to five days--a week--I try to [stay about]. Can you tell any difference in the net on your income?
WYATT: Yeah, you make more.
UPTON: Yeah, that's exactly what happened to me.
WYATT: Well, for myself, back when I was doing it that way, I had more help and I spent more of my time fixing their mistakes. So my profits went down because I was actually spending more time doing the job to get it done right. And then a lot of times, I would have to have them-- I mean, if I would lay out a wall and, guys, you all run this wall [inaudible out behind], this is the way it's done and I go around and get the scaffold set, that freed me up to do—I could either lay brick or I could make sure that the job was kept going more smoothly and in front of the other guys. Well, you come back and the wall's not right, you've got to tear it down. So I pay them to lay it, now I'm paying them to tear it down, now I've got to turn around and pay them to lay it again.
Now, I'm not real smart, but I found out pretty quick that I was losing money. I just don't do that any more. I'm a smaller crew now, we do it right. If I do make a mistake, I mean, the only person I'm going to have to fuss at is myself and I'm not going to fuss at myself too often because I don't like being fussed at. I mean, that's just the way I do it.

It is worth remarking that there is no mention of injury risk in the above sequence. However, being in a hurry was identified in all groups as an injury risk, and, in general, economic pressures were the primary motivation for being in a hurry. Being in a hurry increased the risk of injuries or, as in the above extract, loss or waste of materials. Injury or wasted materials would lead to direct economic loss, and indirect costs (e.g., adverse consequences to the reputation of the business for good quality work). Because these were all small companies, the issue of reputation for quality work was of central importance because it helped them to remain competitive with larger companies that might be able to underbid them. On the whole, it was best to maintain a pace of work that would permit quality work to be done. It was generally believed that this would tend to be a safer pace of work.

Other common assertions across groups included:

- a clutter-free worksite was a sign that workers valued safety and the quality of their work;
- qualities that employers valued in their employees included common sense, being motivated by a desire to learn the trade, and a sense of loyalty to the company owner and co-workers;
- employers also felt that loyalty was a two-way street. In return for the loyalty, productivity, and craftsmanship they expected of their employees, owner-operators felt it was important to show consistent concern for their employees' safety and welfare (e.g., communicating that safety was as important as getting the job done, and helping them out in times of family difficulties).

Major themes identified in the focus group analysis were embedded in the simulation exercises (Table 2). Narrative point-of-view was varied across simulations (2nd or 3rd person). For each injury type (i.e., back or fall) one simulation had successful prevention of an injury as an outcome, whereas in the others, an injury event occurred. Content validity of the simulations, and, by extension, of the focus group themes from which they were derived was supported by the authentication focus groups), and no new themes emerged from those groups. Copies of each of the simulations (including a problem booklet, master answer sheet and evaluation questionnaire are included as Appendices (C; Year 2, Back Injury and D, Year 3, Falls).

Table 2. Themes imbedded in simulation exercises.

TITLE	YEAR	THEMES	TYPE OF WORK	NARRATIVE POINT-OF-VIEW	INJURY EVENT	FALL/ BACK
Bob's Builders	02	• inexperienced worker • hurry/pacing • coaching • improper lifting	block laying	third person	yes	back
Rogers' Remodeling	02	• clutter • planning • communication	residential remodeling	second person	no	back
Smitty's Drywall	02	• fatigue • workload • clutter • hurry • improper lifting	drywall installation	third person	yes	back
Up on the Roof	03	• inexperienced worker • planning • fall protection	roof repair	third person	no	fall
Deck Dilemma	03	• work site conditions • clutter • planning	exterior deck	second person	yes	fall
Off to a Late Start	03	• inexperienced workers • coaching • checking equipment	vinyl siding installation	third person	yes	fall

Phase 2 (Year 2): Back Injury Simulations (Group and Home Administration)

Procedures

In Year 2, companies were stratified geographically as we had done for the focus groups. In order to minimize travel time and distances for participants in group administration, in each of the eight regions, a core area (e.g., county or counties) with the highest concentration of policies was identified, and companies in these concentrations constituted the sampling frame for group administration. All other companies in the region constituted the sampling frame for home administration. Within each sampling frame, companies were randomly selected to receive written invitations to participate in that intervention arm. Companies that were not selected constituted the control sampling frame.

Companies in either intervention sampling frame received a written invitation on project letterhead that clearly identified the project as a joint endeavor of KEMI and KIPRC. Letters were signed by the Chief Executive Officer of KEMI and the project principal investigators. Invitations were mailed according to a staggered schedule to assure a consistent interval in each region between the invitation and the scheduled group administration session. Home administration companies were invited in each region according to the same staggered schedule to minimize temporal or historical biases arising between responses of home and group administration subjects in each region. Project staff attempted to contact all invited companies by phone to further explain the study and participation incentive (a 10% premium discount at policy renewal), answer questions, and encourage participation.

We had greater success in securing the interest of company owner-operators in participating in home administration. Recruiting phone contacts with owner-operators led us to believe that the premium discount incentive was appealing. As with the group administration, the evaluations we received from those who participated indicated they found the intervention realistic and very worthwhile (in terms of both content and time required to complete the materials). However, in the last two months of home administration the return rate tailed off. Our recruiting efforts continued for home administration, but we were concerned by the declining return rate. While we suspected the decline was because we were into a very busy time of year for construction, we did not have any mechanism for confirming that suspicion.

Due to low response rates, another set of companies was drawn from the sampling frame for home administration. All companies previously contacted for this project were excluded and 400 companies were then randomly selected from the data base. Additionally, 300 companies were randomly selected out of the 400 companies. These 300 companies were contacted first. The remaining 100 companies were only used as a supplemental list to replace companies on the list of 300 that were no longer policy holders with KEMI. Since the group administration arm had been closed to enrollment, it was no longer necessary to sample by region.

The control group was from a randomly selected 15% (423) of the remaining companies in the database. A large number was selected to offset policy turnover (i.e., companies that no longer had policies with KEMI).

In keeping with KEMI's commitment to Loss Education all Intervention participants in both Years received a one page monthly safety newsletter for 7 months following return of completed materials (Year 2 Appendix E, Year 3 Appendix F). In consultation with NIOSH officials, we conducted an anonymous administration of the pre-test instrument, with the addition of several questions pertaining to non-participation, among owner-operators of companies who declined to

participate in either group or home administration, or who indicated they would participate but did not. The purpose of this sampling was to learn more about factors that contributed to non-participation in safety interventions. This was not completed until late in Year 2 and the response rate was low. Therefore, these data were combined with responses in Year 3, and will be presented with Year 3 results.

Methods

In Year 2, in addition to assessing simulation performance scores and psychometric properties of the simulations, we developed a 20-item questionnaire to measure safety climate (nine items: six reflecting company commitments to safety and three reflecting economic pressures), self-efficacy (three items), and safety beliefs (eight items)). All Year 2 survey questionnaires can be found in Appendix G. Items used 6-tier Likert-type scales for either agreement (1 = Strongly Disagree to 6 = Strongly Agree) or frequency (1 = Hardly Ever to 6 = Almost Always). All but one of the Safety Climate items used the frequency ratings, as did one of the Self-efficacy items. All Safety Belief items, two Self-efficacy items, and one Safety Climate item used the Agreement scale. In addition, three items using 100 mm Visual Analog Scales (VAS; one VAS item for each of the intended dimensions) were included on the PRE and DPT. In order to reduce response burden, these were the only items on the IPT and RPT. Item stems, intended dimensions, and scale type are shown in Table 3. Item numbering reflects location on PRE (see Appendix E for all Year 2 Measures). Seven items were intended to be reverse-scored ([R] in Table 3). These items were used as a pre-test (PRE) and delayed post-test (DPT).

In addition, we were interested in the so-called plural change typology (Golembiewski, Billingsley, & Yeager, 1976). Golembiewski et al. argued that conventional approaches to measuring change as simply a pretest to post-test score difference generally overlook necessary underlying assumptions pertaining to the stability of subjective judgments about scale calibration or conceptualizations of the domain being measured. These assumptions are particularly important when interventions intentionally or unintentionally alter subjects' understanding of either the range and gradations of a measure of a dependent variable, referred to as *beta* change, or of the nature of the construct or domain being measured, referred to as gamma change (Golembiewski et al., 1976). Failure to test for either type of change may lead to erroneous conclusions (e.g., Type II error) about change or a lack thereof. Specifically, we were interested in the issue of whether there was evidence of beta change (also-called a 'response shift' (Howard, 1980; Howard & Dailey, 1979, Terborg, Howard, & Maxwell, 1980). This required including a retrospective pretest (RPT) along with the DPT, and testing for differences between PRE and RPT as well as PRE and DPT measures. Testing for gamma change is more complex. Typically, it involves confirmatory factor analysis or related techniques.

The RPT asks subjects taking a post-test (in our case, the DPT) to reassess how they stood in relation to the questionnaire items prior to the intervention. (For this reason, an RPT is sometimes referred to as a 'then-test,' i.e., how things were 'then' – at the time of the pretest – in light of what the respondent knows 'now' in virtue of participation in the intervention). Ordinarily in an RPT, all items in the pre- and post- measures are repeated with an appropriate change in wording for the stem. This would have doubled the number of items on our follow-up survey (i.e., 20 DPT + 20 RPT), and we were concerned about the increased response burden. For this reason we opted to use three single item proxies for the RPT: one each for safety

climate, self-efficacy, and safety belief. Each RPT item was rated on a visual analogue scale (VAS) because we thought there might not be sufficient rating variance with single-item Likert-type scales. In order to test for response shift, we included present-tense versions of these three VAS items on the PRE measure (i.e., how things are 'now'), and also as an immediate post-test (IPT). Use of these items on the IPT was not necessary to assess for response shift; rather, they were used to assess whether there was any immediate change in how subjects responded to these items once they were aware of the nature and focus of the simulations. In summary, the measures and items at each stage of Year 2 consisted of:

- PRE: 12 demographic and work-related items; 3 VAS items ('now' versions), and 20 Likert-scaled items (Intervention and Controls).
- IPT: 3 VAS items ('now' versions; Intervention only).
- DPT: 3 VAS items ('now' versions), and 20 Likert-scaled items (i.e., identical to the PRE minus the 12 demographic and work-related items; Intervention only).
- RPT: 3 VAS items ('then' versions; administered concurrently with DPT for Intervention participants and concurrently with PRE for Controls).

Statistical Analysis (Year 2 and Year 3)

In Years 2 and 3, demographic variables were analyzed descriptively with measures of central tendency and variability appropriate to the level of measurement of a given variable. Inferential analyses included χ^2 analysis, independent and dependent Student's t-tests, and analysis of variance (ANOVA) with post hoc Fisher's Least Significant Difference tests as appropriate to the level of measurement and number of groups.

Psychometric analyses for the safety climate, self-efficacy, and safety belief items included principal axis factor analysis with varimax rotation to assess whether items factored into theoretically expected dimensions, and Cronbach's coefficient alpha (Cronbach's α) for internal consistency. Psychometric analyses for the simulations included item-to-question and item-to-total correlations and the Kuder-Richardson-20 (KR-20) statistic for internal consistency (a variant of Cronbach's α for dichotomous responses). Several caveats with respect to the use of reliability statistics in simulation exercises of this nature will be discussed in a subsequent section when those results are presented.

Table 3. Year 2: Item stems, scale types, intended dimensions, and administration intervals for Safety Climate, Beliefs, & Self-Efficacy.

Item Stem and Scale Type	Intended Dimension, Scale Type, & Anchors	Administered[a]
Item Number[b] and Stem		
	Likert Type: Agree / Disagree (1 = Strongly Disagree; 6 = Strongly Agree)	
16. Back support belts are the best way to prevent back injuries.	Safety Belief [R][c]	PRE, DPT
17. Cleaning up a cluttered work site is not usually worth the time or trouble.	Safety Belief [R]	PRE, DPT
18. Financial pressures keep companies like ours from doing things as safely as possible.	Safety Climate [R]	PRE, DPT
19. Experienced workers have enough common sense that they never need to be reminded about how to do things safely.	Safety Belief [R]	PRE, DPT
20. When I see someone doing something unsafe, I feel I am able to take some action to make the situation safer.	Self-Efficacy	PRE, DPT
21. Working at a steady pace is one of the best ways to keep people from getting injured on the job.	Safety Belief	PRE, DPT
22. Working closely with an experienced worker is one of the best ways for less experienced employees to develop safe work habits.	Safety Belief	PRE, DPT
23. Sometimes even experienced workers do not pay close enough attention to the job they are doing.	Safety Belief	PRE, DPT
24. When I think a worksite is not safe, I feel confident that I can figure out a way to make it safer.	Self-Efficacy	PRE, DPT
25. Putting up safety posters in work areas is the best way to let employees know that safety is a priority.	Safety Belief [R]	PRE, DPT
26. It is worth the time and trouble to make sure you have the right tools for a job before starting any task.	Safety Belief	PRE, DPT

Table 3. (Continued)

Item Number and Stem	Likert-Type: Frequency (1=Hardly Ever; 6 = Almost Always)	
27. Everyone works together as a team to make work conditions safe.	Safety Climate	PRE, DPT
28. I take the time to plan out what is necessary to do a job safely.	Safety Climate	PRE, DPT
29. Supervisors and employees freely share their concerns and ideas about safety on the job.	Safety Climate	PRE, DPT
30. We work short-handed.	Safety Climate [R]	PRE, DPT
31. We take the time and trouble to make worksite conditions as safe as possible before starting any job.	Safety Climate	PRE, DPT
32. Supervisory personnel communicate that keeping safe is as important as getting the job done.	Safety Climate	PRE, DPT
33. Experienced workers take the time to show less experienced workers the safest way to get a job done.	Safety Climate	PRE, DPT
34. I feel capable of making good decisions about what safety equipment is needed to get a job done safely.	Self-Efficacy	PRE, DPT
35. Financial pressures keep me from doing things as safely as possible.	Safety Climate [R]	PRE, DPT
	100 mm Visual Analog Scale (VAS)	
13. In our company, employees feel that doing the job safely is as important as getting the job done.	Safety Climate (0 = Never; 100 = At all times...)	PRE, IPT, DPT, RPT
14. I am confident in my ability to make work as safe as possible for myself and my co-workers.	Self-Efficacy (0 = Never; 100 = At all times...)	PRE, IPT, DPT, RPT
15. I believe that hurrying to get the job done costs more in the long run.	Safety Belief (0 = Totally Disagree; 100 = Totally Agree)	PRE, IPT, DPT, RPT

[a] PRE = Pretest (Intervention and Control: Now); IPT = Immediate Post-Test (Intervention only: Now); DPT = Delayed Post-Test (Intervention only, ~ 4 months post-intervention: NOW); RPT = Retrospective Pretest (Intervention concurrent with DPT, asked to rate 4 months ago;' Control concurrent with PRE, asked to rate 'Now and 4 months ago')

[b] Item numbering as on PRE; [c] [R] = Item intended to be reverse-scored

Results

Participation

In Year 2, 564 companies were invited by mail to participate in the intervention. Of these, 359 (64%) either declined when contacted by phone or could not be reached by phone. The remaining 205 companies (36%) were recruited to participate (i.e., the owner agreed in a phone contact to participate in group or home administration). The outcome of this recruitment through out the project is shown in Table 4. In all, there were 148 individual returns from both group and home administration in Year 2. Five of the returns were not usable due to incompleteness. Table 4 also shows the recruitment and participation for Control, Decline, and Agree no Return companies.

At the end of Year 2 a mail survey was conducted to determine if the safety newsletters were read and found useful by the participants. Only 26 of 148 newsletter surveys were returned (18%). The percentages of respondents who reported reading each newsletter ranged from 69% to 89%. Similar percentages of respondents (61% to 78%) reported finding the newsletters useful.

In addition we were interested in finding out what type and format the participants preferred for safety training. Home administration was preferred by 66% of the respondents over toolbox meetings or group administration. The latent image story booklets were chosen as the preferred format for safety training by 79% of respondents over computer diskette or CD-ROM and Web-based. Due to the low response rate to this survey, we decided not to repeat it in Year 3.

Table 4. (a) Recruitment for Year 2 Intervention participation.

	# of Companies Invited By Mail	# Companies Sent Intervention	# of Individual Interventions Sent	# of Companies Returning Intervention	# of Individual Interventions Returned	Initial # of Follow-Up Surveys Returned	Reminder Cards Sent	Final # of Follow-Up Surveys Returned
GROUP	150	25	38	25	38	9	29	15
HOME	414	150	430	48	110	37	73	48
TOTAL	564	175	468	73	148	46	102	63

(b) Recruitment for Year 2 Control participation.

	# Companies Invited By Mail [a]	# of Follow-Up Surveys Returned [b]
CONTROLS	206	32
DECLINE	95	12
AGREE NO RETURN	81	14
TOTAL	382	58

[a] One anonymous survey was cent to each company owner.
[b] Represents the total numbers of surveys returned after reminder cards sent.
Due to the anonymity of the surveys one thank you/reminder card was sent to all.

Back Injury Simulations

Demographics

In Year 2, three simulations pertaining to back injuries (Bob's Builders, Rogers' Remodeling, and Smitty's Drywall) were field-tested in both group and home administration formats (n = 38 and 105, respectively). The 143 intervention participants represented 73 companies (39% general contracting; 13% plumbing, heating, air conditioning; 11% electrical; 11% excavation; 26% other special trades). There were no significant differences between home versus group subsamples in age, education, years of experience in construction, average months per year or hours per week of employment in construction, nor in the relative proportions of owner-operators, supervisors, or employees. Therefore, demographic analyses ignore the home versus group administration distinction.

We found no demographic differences between control group respondents (n = 32, all owners) and two purposively sampled groups of owners who had been invited by mail to participate but either declined at the phone contact (Decline; n = 12) or agreed to participate over the phone but from whom we received no completed intervention materials (Agree no Return; n = 14). For demographic analyses, the Decline and Agree no Return purposively sampled groups were aggregated.

Not surprisingly, there were clear demographic differences between participants and controls, because the control group consisted entirely of owner-operators, whereas intervention participants included non-supervisory employees (n = 76) in addition to owner-operators and supervisory personnel (n = 67). Age, educational attainment, and experience in construction (in years), as well as hours per week usually worked are shown in Table 5 for intervention participants (Owner/supervisors vs. employees), controls, the Decline/Agree no Return group, and the sample as a whole. One-way analysis of variance (ANOVA) revealed an overall difference that was significant at a $p < .001$ level for each variable except education (*ns*). Significant pairwise comparisons between groups (Fisher's Least Significant Difference Tests) are also shown in Table 5.

Table 5. Year 2: Age, education, and work experience/hours by groups ($N = 201$).

		N	*Mean*		*SD*	*SE*	*95% CI* Lower	Upper	ANOVA	*SS*	*df*	*MS*	*F*	*p* ≤
AGE	PARTICIPANT—OWNER/SUPERVISOR	76	43.1		11.5	1.3	40.46	45.7						
	PARTICIPANT—EMPLOYEE	67	32.6	***	10.5	1.3	30.00	35.1						
	CONTROL—OWNER	32	47.8		12.9	2.3	43.13	52.4	Between	6824	3	2274.54	16.44	0.001
	DECLINE OR AGREE NO RETURN—OWNER	26	44.4		14.0	2.7	38.78	50.1	Within	27263	197	138.39		
	Total	201	40.5		13.1	0.9	38.69	42.3	Total	34086	200			
EDUCATION	PARTICIPANT—OWNER/SUPERVISOR	75	12.8		2.7	0.3	12.22	13.5						
	PARTICIPANT—EMPLOYEE	66	11.9		2.4	0.3	11.28	12.4						
	CONTROL—OWNER	30	12.9		2.7	0.5	11.94	13.9	Between	41	3	13.79	2.16	0.094
	DECLINE OR AGREE NO RETURN—OWNER	26	12.6		2.3	0.4	11.70	13.5	Within	1230	193	6.37		
	Total	197	12.5		2.5	0.2	12.14	12.9	Total	1271	196			
EXPERIENCE	PARTICIPANT—OWNER/SUPERVISOR	76	18.8	a	11.3	1.3	16.22	21.4						
(YEARS IN	PARTICIPANT—EMPLOYEE	64	9.2	***	8.0	1.0	7.23	11.2						
CONSTRUCTION)	CONTROL—OWNER	32	23.4		11.0	1.9	19.40	27.3	Between	6586	3	2195.17	20.76	0.001
	DECLINE OR AGREE NO RETURN—OWNER	26	23.7		11.3	2.2	19.15	28.2	Within	20518	194	105.76		
	Total	198	17.1		11.7	0.8	15.44	18.7	Total	27104	197			
HOURS/WEEK	PARTICIPANT--OWNER/SUPERVISOR	76	39.6	b, c	11.1	1.3	37.04	42.1						
	PARTICIPANT--EMPLOYEE	65	35.9	d	9.9	1.2	33.44	38.3						
	CONTROL--OWNER	32	46.6	**	11.0	1.9	42.60	50.5	Between	2453	3	817.55	6.64	0.001
	DECLINE OR AGREE NO RETURN--OWNER	26	40.2	e	13.8	2.7	34.57	45.7	Within	23994	195	123.05		
	Total	199	39.6		11.6	0.8	37.95	41.2	Total	26447	198			

** $p < .03$ vs. each other group
*** $p < .001$ vs. each other group
[a] $p < .04$ vs. other owners
[b] $p \sim .05$ vs. participant employees
[c] $p < .003$ vs. Control--Owners
[d] $p < .001$ vs. Control--Owners
[e] $p < .03$ vs. Control--Owners

There was no difference between groups in the average number of months per year worked (Overall Mean ~ 11 months) or in the average number of career work-related injuries (Overall Mean ~0.6; Range for group means 0.4 to 0.8). Groups were also similar in terms of the number of self-reported injuries, company safety meetings, and frequency of distribution of safety education materials over the last year.

Simulation Performance

In each simulation, the narrative leads to a series of decision points culminating in a question. Typically questions ask about what one of the characters should do next, or about the possible consequences of some event or action. Thus, for every question there are several possible issues or ramifications in the form of individual items with which the participant can either agree or disagree. This gives rise to two alternative scoring methods.

The first method weights each question (decision point) as contributing an equal percentage of the total score (i.e., the number of questions divided by 100), thereby normalizing the total possible score to 100%. This permits comparison of scores for each question and the total score in a common metric of percentage correct ('Percent Mastery'). Performance data shown in Table 6 shows these mastery scores by simulation and by question. In order to facilitate descriptive statistical comparisons across simulations, the Question Percent Mastery scores in Table 6 have been normalized as a percentage of the highest possible score for each question. The pooled mean score for the three simulations was approximately 83% (SD = 8.9). Table 6 also includes limited summary psychometric data for the simulations (Cronbach's α and the corrected Question-Total correlation [$r_{(Ques/Tot)}$] for each question).

Interpretation of any summary reliability statistic for simulation exercises is problematic because narrative structure and cumulative feedback during the simulation violate necessary assumptions of global reliability estimates (e.g., Cronbach's α or the Kuder-Richardson-20 variant for dichotomous responses [KR-20]). Specifically, items are not sampled from a single domain, and item responses are not independent of one another. For adult learners, the simulation narrative must portray competing demands and complex events if it is to be deemed realistic (i.e., valid). Furthermore, simulations teach as well as test. Thus, each question informs the learner that there is either one and only one correct response or several that are correct. The participant receives immediate feedback on each response. In addition, an incorrect choice on a question that has only one correct response generates feedback that asks the participant to choose another option. This is not a problem in terms of scoring because incorrect responses detract from the Question and Total scores. However, this clearly violates any assumption of item-independence (Cole, 1994; Cole, McLymore, McKnight, & Piercy, 1994; Cole, McKnight, & Rodgers, 1996; Kidd, Cole, Isaacs, & Parshall, 1996).

Unfortunately, other methods of generating reliability estimates are equally unsatisfactory. Split-half reliability also assumes item-independence, and test-retest reliability assumes that participants' knowledge of the (presumably single) tested domain has not changed over the retest interval. In a sharp departure from that assumption, exercises are intended to influence knowledge, attitudes, and behavior by portraying vivid and memorable situations. Therefore, in addition to tapping content from multiple domains, assumptions that participants' scores will be stable over time are questionable at best (Cole, McKnight et al., 1996).

Table 6. Year 2 Back injury narrative simulation performance results: Question and total scores as percent of maximum possible.

	Mean	*SD*	*SEM*	Mode	Skewness	Kurtosis	Percentiles 25th	Median	75th	$r_{(Ques/Tot)}$
BOB'S BUILDERS (n = 143; Standardized alpha = .45)										
QUESTION A	86.36	18.22	1.52	100	-1.28	1.29	75	100	100	0.24
QUESTION B	92.17	15.02	1.26	100	-2.76	9.62	80	100	100	0.05
QUESTION C	73.63	18.05	1.51	71	-0.53	-0.12	57	71	86	0.31
QUESTION D	73.43	18.82	1.57	75	-0.80	1.49	75	75	75	0.29
QUESTION E	72.96	19.05	1.59	83	-0.87	0.42	67	83	83	0.33
TOTAL SCORE	79.71	10.09	0.84	83	-0.59	-0.22	73	81	87	
ROGERS' REMODELING (n = 143; Standardized alpha = .61)										
QUESTION A	84.79	19.24	1.61	100	-1.37	2.35	75	100	100	0.53
QUESTION B	91.96	17.45	1.46	100	-2.36	5.19	100	100	100	0.28
QUESTION C	91.72	14.92	1.25	100	-2.49	8.10	83	100	100	0.48
QUESTION D	77.20	18.32	1.53	80	-0.78	0.45	60	80	80	0.28
TOTAL SCORE	86.42	11.84	0.99	95	-1.77	5.11	80	89	95	
SMITTY'S DRYWALL (n = 142; Standardized alpha = .67)										
QUESTION A	80.89	15.57	1.30	83	-0.49	-0.11	67	83	100	0.39
QUESTION B	75.80	18.67	1.56	80	-0.20	-0.92	60	80	100	0.42
QUESTION C	89.51	12.90	1.08	100	-1.30	1.65	88	88	100	0.47
QUESTION D	81.99	18.86	1.58	100	-0.71	-0.22	75	75	100	0.38
QUESTION E	90.38	15.67	1.32	100	-1.15	-0.15	67	100	100	0.42
TOTAL SCORE	83.70	10.71	0.90	97	-0.67	0.38	75	85	93	
Pooled Score	83.3	8.9								

The second scoring method weights each individual item equally as a percentage of the total score (i.e., essentially treating each item-response as a separate true-false choice). This permits identification of problems with individual items (e.g., whether a 'difficult' item is merely unintentionally tricky or confusing versus actually representing some key point that, perhaps, is not widely appreciated). Table 7 shows these analyses for each simulation used in Year 2. Because items were dichotomous, the mean for each item corresponds to the proportion who chose each item whereas item difficulty reflects the proportion who chose the correct response. The letter prefixes that precede each item number indicate the simulation "question" (Table 6) to which the item belonged. The 'Sign' column in Table 7 indicates whether it was correct (+) or incorrect (-) to choose the item. Thus for "+" items, Difficulty equals the item mean, whereas for "-" items, Difficulty equals 1 minus the item mean.

The correlation coefficients reported in Table 7 are corrected item-total correlations (i.e., the correlation of the item score with the total minus the item score). Because items were dichotomous, this is a point-biserial correlation and the overall reliability estimate is the Kuder-Richardson-20 (KR-20) variant of Cronbach's coefficient alpha. The same caveats with respect to reliability that were detailed earlier in reference to Table 6 apply with equal or greater force to the reliability estimates in Table 7 arguably, with greater force because of the inflation of error when point-biserial correlations are used. Statistical significance levels for the correlations were imputed by means of a standard table for critical values of the correlation coefficient. Threshold values for the $p < .05$ and .01 significance levels were $r = .17$ and $r = .23$, respectively. However, given that items are not independent and reflect heterogeneous domains, interpretation of item-total correlations and their statistical significance is just as problematic as for the overall reliability estimates.

Nevertheless, these correlations and significance levels have some utility in assessing item discrimination. Items which have significant positive correlations with the score total are said to discriminate positively (i.e., high scorers tended to make the correct choice on the item to a greater extent than low scorers). Item-total correlations that are not significant imply that the item did not discriminate between high and low scorers. A significant *negative* correlation implies that the item discriminates negatively (i.e., low scorers tended to make the correct choice to a greater extent than high scorers which suggests the item should be scrutinized. In only one of these exercises (Bob's Builders) were any of the item-total correlations negatively signed, but these few negative correlations were near-zero (i.e., they did not discriminate but were not negatively discriminating). For each exercise, the relative proportions of items that were positively discriminating (at either a $p < .05$ or $p < .01$ criterion) versus not discriminating are shown in Table 8.

The proportion of items that were found not to discriminate (i.e., $r < |.17|, p > .05$; Range for percentages of non-discriminating items, 26% to 50%) was similar to or better than what has been found in longer simulation exercises (cf. Cole, McKnight et al., 1996; Kidd et al., 1996). Because simulations are teaching as well as testing instruments, it is expected that items will not all be highly discriminating (e.g., items must first and foremost be plausible and relevant in the light of the simulation narrative). However, it is clear in Table 8 that the first simulation had a lower percentage of positively discriminating items than the other two. Reasons for this are not clear.

Table 7. Item analyses for simulations #1, #2, and # 3: Answer (item) means, standard deviations, difficulties,* and corrected item-total correlations ($r_{ans/tot}$).†

(a) Simulation #1 BOB'S BUILDERS (n = 143; KR-20 = 0.53).

Item	Sign	Mean	SD	Difficulty	$r_{ans/tot}$	$p <$
A01	-	0.24	0.43	0.76	0.06	(ns)
A02	+	0.91	0.29	0.91	0.18	0.05
A03	+	0.83	0.38	0.83	0.23	0.01
A04	-	0.04	0.20	0.96	0.08	(ns)
B05	-	0.04	0.20	0.96	0.26	0.01
B06	-	0.02	0.14	0.98	0.20	0.05
B07	+	1.00	0.00	1.00	n/a	n/a
B08	-	0.04	0.18	0.97	0.11	(ns)
B09	-	0.29	0.46	0.71	0.03	(ns)
C10	+	0.48	0.50	0.48	0.15	(ns)
C11	+	0.77	0.42	0.77	0.25	0.01
C12	+	0.69	0.47	0.69	0.14	(ns)
C13	-	0.20	0.40	0.80	-0.05	(ns)
C14	+	0.83	0.38	0.83	0.30	0.01
C15	+	0.81	0.39	0.81	0.26	0.01
C16	-	0.22	0.41	0.78	0.02	(ns)
D17	+	0.90	0.31	0.90	0.14	(ns)
D18	+	0.71	0.46	0.71	0.24	0.01
D19	-	0.55	0.50	0.45	-0.06	(ns)
D20	+	0.88	0.32	0.88	0.19	0.05
E21	+	0.84	0.37	0.84	0.16	(ns)
E22	+	0.94	0.23	0.94	0.30	0.01
E23	-	0.71	0.45	0.29	-0.09	(ns)
E24	+	0.86	0.35	0.86	0.40	0.01
E25	+	0.84	0.37	0.84	0.40	0.01
E26	+	0.61	0.49	0.61	0.24	0.01
Mean Item Difficulty				0.79		

Table 7. (Continued)

(b) Simulation #2 ROGER'S REMODELING (n = 143; KR-20 = 0.65).

Item	Sign	Mean	SD	Difficulty	$r_{ans/tot}$	$p <$
A01	+	0.86	0.35	0.86	0.07	(ns)
A02	+	0.80	0.40	0.80	0.20	0.05
A03	-	0.05	0.22	0.95	0.55	0.01
A04	-	0.22	0.41	0.78	0.39	0.01
B05	-	0.10	0.30	0.90	0.25	0.01
B06	-	0.14	0.35	0.86	0.25	0.01
B07	+	0.99	0.12	0.99	0.00	(ns)
B08	-	0.07	0.26	0.93	0.40	0.01
C09	-	0.04	0.18	0.97	0.58	0.01
C10	+	0.94	0.23	0.94	0.42	0.01
C11	+	0.82	0.39	0.82	0.10	(ns)
C12	-	0.06	0.23	0.94	0.48	0.01
C13	+	0.96	0.20	0.96	0.46	0.01
C14	+	0.87	0.33	0.87	0.17	0.05
D15	+	0.93	0.26	0.93	0.24	0.01
D16	-	0.62	0.49	0.38	0.01	(ns)
D17	+	0.85	0.36	0.85	0.20	0.05
D18	+	0.82	0.39	0.82	0.25	0.01
D19	+	0.89	0.32	0.89	0.17	0.05
Mean Item Difficulty				0.86		

Table 7. (Continued)

(c) Simulation #3 SMITTY'S DRYWALL (n = 143; KR-20 = 0.62).

Item	Sign	Mean	SD	Difficulty	$r_{ans/tot}$	$p <$
A01	+	0.94	0.23	0.94	0.19	0.05
A02	+	0.72	0.45	0.72	0.17	0.05
A03	+	0.96	0.19	0.96	0.22	0.05
A04	-	0.10	0.30	0.90	0.23	0.01
A05	-	0.20	0.40	0.80	0.16	(ns)
A06	+	0.53	0.50	0.53	0.10	(ns)
B07	+	0.90	0.30	0.90	0.23	0.01
B08	-	0.46	0.50	0.54	0.17	0.05
B09	+	0.96	0.20	0.96	0.28	0.01
B10	-	0.32	0.47	0.68	0.15	(ns)
B11	+	0.70	0.46	0.70	0.17	0.05
C12	+	0.96	0.20	0.96	0.25	0.01
C13	+	0.94	0.23	0.94	0.15	(ns)
C14	+	0.67	0.47	0.67	0.32	0.01
C15	+	0.97	0.17	0.97	0.13	(ns)
C16	-	0.08	0.27	0.92	0.10	(ns)
C17	+	0.92	0.28	0.92	0.26	0.01
C18	+	0.85	0.36	0.85	0.38	0.01
C19	-	0.07	0.26	0.93	0.11	(ns)
D20	+	0.99	0.12	0.99	0.28	0.01
D21	+	0.91	0.29	0.91	0.22	0.01
D22	+	0.73	0.45	0.73	0.32	0.01
D23	-	0.34	0.47	0.66	0.08	(ns)
E24	+	0.99	0.08	0.99	0.31	0.01
E25	+	0.75	0.44	0.75	0.26	0.01
E26	-	0.03	0.17	0.97	0.29	0.01
Mean Item Difficulty				0.84		

* All individual items are dichotomous. The item mean (Column 3) is the proportion of persons who selected the item. Item difficulty (Column 5) is the proportion who chose the correct response for each item. For items marked with a '+' sign in column 2, Mean = Difficulty. For items marked with a '-' sign in column 2, Mean = 1-Difficulty. Also, for a fixed sample size, the standard deviation (*SD*) for any binary proportion is a constant, thus it does not really convey unique information not contained in the mean.

† Corrected item-total correlations calculated after reverse-scoring all items with negative signs in Column 2.

Table 8. Item discrimination: Percentage of exercise items that correlated with exercise total score positively ($p < .01$ or $p < .05$ criterion) or not at all[a] for three Back injury simulations ($n = 143$).

Exercise	Criterion	Positive	No Relationship[b]
Bob's Builders	$p < .01$	38% (10 items)	
26 items[c]	$p < .05$	50% (13 items)	50% (13 items)
Rogers'			
Remodeling	$p < .01$	58% (11 items)	
19 items	$p < .05$	79% (15 items)	21% (4 items)
Smitty's Drywall	$p < .01$	50% (13 items)	
26 items	$p < .05$	69% (18 items)	31% (8 items)

[a] No significant negative correlations at either criterion level

[b] i.e., $p > .05$ ($r \leq |.17|$)

[c] One item (#7) had no item variance (all correct) among all subjects with a completed simulation ($n = 143$). This item was counted as No Relationship because it could not discriminate between higher and lower scorers.

Simulation performance was independent of age, education, experience in construction, or past injury in construction. We found no evidence of a significant difference in overall simulation performance between owner-operators or supervisors versus non-supervisory personnel. Only one question score (Smitty's Drywall Question D, which pertains to possible ways a back injury like the one in the story might have been prevented) gave evidence of a statistically significant difference. The Mean (*SD*) normalized Question D score was 78.4 (*SD* = 19.4) for employees versus 85.2 (*SD* = 17.9) for owners and supervisors, $t(135) = 2.18$, $p = .03$. However, none of the individual item scores showed a significant score difference between groups, and given the total number of simulation questions (i.e., 14 Questions, hence 14 significance tests), a finding of a single significant difference could well have been a chance occurrence.

Of interest, the lack of differences by employment position status mirrors findings of the qualitative analysis in Phase 1. We did not find any substantial evidence of systematic differences according to position status in our focus group data in terms of opinions or attributions about safety issues, risks, protective factors, or desirable and undesirable traits of workers with respect to safety.

Simulation Evaluations

Each simulation answer booklet was accompanied by a 20-item evaluation questionnaire (Appendix D). Evaluation items were derived from similar questionnaires used with other simulation exercises. Based on prior experience with similar evaluations we anticipated that the questionnaire items would coalesce around three dimensions. This expectation was generally borne out by principal axis factor analysis (PFA) with varimax rotation for each evaluation questionnaire. We have labeled the three evaluation dimensions Exercise quality (3 items), Realism (3 items), and Applicability to Work (9 items). Five items were discarded from the analysis because of content redundancy, inconsistent response profiles (e.g., indicating ambiguous interpretations) or inadequate contribution to subscale reliability.

Each subscale for each simulation evaluation had good to excellent internal consistency. Table 9 summarizes the evaluation subscale and total scores and internal consistency estimates (Cronbach's α) for the Year 2 simulations. Evaluation data in Table 9 suggest that on the whole, evaluations were favorable. Subscale scores for Realism and Exercise Quality were significantly higher than scores on the Applicability to Work subscale ($p < .001$). We believe this reflects the heterogeneity of work types included in the sample. Because, at least superficially, each exercise appeared to focus on a particular trade or activity (Masonry, Carpentry, and Drywall), it is possible that participants who worked in other trades may have found some simulation content less applicable to their trade or primary work activity. Indirect evidence in support of this interpretation may by found by examining the percentiles in Table 9. For judgments of Realism and Exercise Quality, 75% of the sample gave a rating of at least 80% of the maximum possible, whereas less than 50% of the sample gave ratings in that range for Applicability to Work. Evaluation scores were independent of age, education, experience in construction, past injury in construction, or employment position status. In addition, there was no correlation between simulation performance and evaluation scores.

Based upon Year 2 findings, several modifications were made to the evaluation questionnaire going into Year 3. These changes were intended to replace items that had poor or indifferent psychometric performance while maintaining the dimensions of the evaluation measure.

Table 9. Summary of Year 2 evaluation results for three Back injury simulations: Mean subscale and total scores and variability normalized to percentages of maximum.

Simulation Title Subscale	Mean	SD	SEM	Mode	Percentiles 25th	 Median	 75th	Cronbach's α
BOB'S BUILDERS (n = 136)								
Applicability to Work (9 items)	76.14	17.02	1.46	98	64	78	91	.94
Realism (3 items)	87.84	13.53	1.16	100	80	93	100	.81
Quality (3 items)	84.31	13.83	1.19	100	80	87	93	.72
Total Evaluation (%)	82.77	11.57	0.99	80	76	83	92	
ROGERS' REMODELING (n = 138)								
Applicability to Work (9 items)	77.60	16.99	1.45	100	68	79	91	.95
Realism (3 items)	87.05	12.68	1.08	100	80	87	100	.78
Quality (3 items)	85.65	13.06	1.11	100	80	87	100	.73
Total Evaluation (%)	83.44	12.12	1.03	100	76	84	94	
SMITTY'S DRYWALL (n = 135)								
Applicability to Work (9 items)	77.30	18.72	1.61	100	67	78	93	.96
Realism (3 items)	87.16	13.50	1.16	100	80	87	100	.83
Quality (3 items)	85.58	14.80	1.27	100	80	87	100	.81
Total Evaluation (%)	83.35	12.91	1.11	100	75	83	95	
Pooled Score	83.1	11.6						

Safety Climate, Beliefs, & Self-efficacy

In Year 2, intervention subjects (n = 143 subjects from 73 companies) completed a pre-test (PRE) and Immediate post-test (IPT) immediately before and after the simulation exercises. They also took a Delayed post-test (DPT) and Retrospective pre-test (RPT) approximately four months later. Control group subjects (owners; $n = 32$) and the two purposively sampled owner groups (Declines and Agreed-No Returns; $n = 26$; see Table 5) took the PRE and RPT measures concurrently. Because the purposively sampled owners were not demographically different from Controls, those three groups were aggregated for purposes of these analyses ($n = 58$ owners/companies).

Factor analytic results are reported for the PRE because it was the only administration in common among all subjects (thus the largest sample size), and because all subjects were unfamiliar with the instrument when they took the PRE. (Factor analytic differences between the PRE and DPT ($n = 63$) were minor and would not have changed decisions about factor structure or which items to retain.) All factor analyses used PAF with varimax rotation. There were only minor differences in PAF results between intervention participants and controls. As all were equally unfamiliar with the instrument at that point, responses were pooled, and the resulting factor analysis of the 20 Likert-scaled items is shown in Table 10. Items with relatively strong primary loadings (> .50) on a single factor were used to estimate putative subscale reliabilities and are highlighted in bold type in Table 10. Loadings less than |.20| are not shown. In this solution only Factor 1 explained more than 10% of common item variance.

Factor 1 corresponded closely to the expected Safety Climate dimension (6 of 9 putative Safety Climate items), but also included one of the Self-efficacy items. The other three putative Safety Climate items (all of which were intended to be reverse scored) loaded together on Factor 3. One of those items (*We work short-handed*) had a relatively weak loading on this factor and was dropped because it attenuated the reliability of the two stronger items on that factor ($\alpha = .66$ for 2 items, < .60 for 3 items). The two remaining Self-efficacy items and two Safety Belief items formed Factor 2, but item communalities and factor reliability were marginal. The two Safety Belief items that loaded as Factor 4 were both reverse scored because they implied that passive measures (posters or back belts) were best methods for promoting safety. Reliability of these two items was poor, and they were dropped. Factor 5 had only one item with a relatively strong loading, and all loadings on Factor 6 were weak.

Table 10. Rotated Factor Matrix: Year 2 pre-test, Participants and Controls (N = 193; Item ns 181-190).

	Factor						Communalities	
	1	2	3	4	5	6	Initial	Extraction
...keeping safe is as important as getting the job done (PRE32)	**0.874**	a					0.70	0.82
We take time…to make sure worksite…as safe as possible before starting (PRE31)	**0.794**	0.255	-0.244				0.74	0.76
Experienced workers take time to show less experienced…the safest way...(PRE33)	**0.737**	0.208					0.62	0.65
Supervisors/employees freely share their concerns & ideas about safety...(PRE29)	**0.695**						0.52	0.54
I take the time to plan out what is necessary to do a job safely (PRE28)	**0.649**					0.315	0.50	0.56
I feel capable of making good decisions about...safety equipment….(PRE34)	**0.643**	0.318					0.56	0.61
Everyone works together as a team to make work conditions safe (PRE27)	**0.589**		-0.222			0.420	0.50	0.59
When I see someone...unsafe, I feel I am able to…make the situation safer (PRE20)		**0.609**					0.30	0.42
Working closely with an experienced worker is one of the best ways… (PRE22)		**0.561**			0.245		0.29	0.42
When I think a worksite is not safe, I feel confident that I can…make it safer (PRE24)	0.228	**0.526**					0.34	0.39
It is worth the time and trouble to make sure you have the right tools for a job….(PRE26)	0.248	**0.408**					0.34	0.25
Financial pressures keep companies like ours from doing things as safely as possible (PRE18)[a]	-0.243		**0.663**				0.36	0.50
Financial pressures keep me from doing things as safely as possible (PRE35)[a]	-0.241		**0.630**				0.34	0.48
We work short handed (PRE30)[a]			0.327			-0.221	0.18	0.18
Back support belts are the best way to prevent back injuries (PRE16)[a]				**0.632**			0.22	0.43
...Safety posters in work areas... best way to let employees know...safety is a priority (PRE25)[a]	0.339			**0.568**			0.35	0.51
Working at a steady pace is one of the best ways to keep people from getting injured...(PRE21)					**0.619**	0.216	0.24	0.48
Experienced workers…never need to be reminded about how to do things safely (PRE19)[a]					0.381		0.17	0.20
Sometimes even experienced workers do not pay close enough attention ....(PRE23)					-0.278		0.10	0.08
Cleaning up a cluttered worksite is not usually worth the time and trouble (PRE17)[a]					0.275	-0.314	0.17	0.20
Initial Eigenvalues Total	5.67	1.62	1.51	1.33	1.24	1.03		
% of Variance	28.36	8.11	7.55	6.65	6.20	5.17		
Rotation Sums of Squared Loadings Total	4.00	1.50	1.25	0.86	0.84	0.64		
% of Variance	19.98	7.52	6.27	4.32	4.18	3.22		
Cronbach's a for primary loadings	0.90	0.63	0.66	< .60	n/a	n/a		

Primary loadings > |.40| in boldface type. Loadings < |.20| not shown

[a] Item intended to be reverse-scored.

A number of considerations were involved in item-reduction. Criteria for retention included a relatively strong primary loading, weak or no cross-loadings on other factors, and adequate subscale reliability. We also made more subjective judgments about the conceptual coherence of items that loaded together, and whether the valences of loadings corresponded to our assumptions about which items should be reverse-scored.

Most of the reverse-scored items performed poorly. For example PRE16 (back belts) and PRE25 (putting up posters), which formed Factor 4, elicited fairly strong agreement even though we felt they entailed a rather passive stance toward safety that should not be considered a 'best' method (e.g., PRE25 had a positive cross-loading on Factor 1). PRE17 and PRE19 had no strong loadings, and loaded positively on Factor 5 with the item on pacing (PRE21, not reversed). This suggested either that subjects were agreeing with items that we felt they should disagree with (i.e., PRE 17 & PRE 19) or that wording was confusing. By the same token, PRE23, which we felt should merit endorsement had a negative loading on Factor 5, suggesting either that subjects were disagreeing with an item we felt should be agreed with or that it was confusing. Score distributions for those three items were more consistent with the supposition that their wording was confusing (e.g., all three had stems that contained negations). Therefore, all five of these items were dropped. This orphaned PRE21 as the only item on Factor 5. Because that loading had a fairly strong communality and there was no substantial cross-loading to any other factor, this item was also dropped.

The four items with primary loadings on Factor 2 were dropped for their lack of conceptual coherence and low communalities and reliability. PRE30 was dropped because it detracted from the reliability of the other two items on Factor 3 and also had an extremely low communality.

In contrast, the two reverse-scored items pertaining to the influence of financial pressures on safety (PRE18 and PRE35) did not include negations in their stems and performed reasonably well. Both loaded strongly and relatively equally on Factor 3, which had adequate internal consistency for a two-item 'subscale.' Both also had weak cross-loadings on Factor 1 that were negative, as should have been the case if they cross-loaded at all on that factor. Therefore, these two items were retained, as were the seven items with primary loadings on Factor 1.

Following item-reduction, the nine remaining items included all but one of the items that were originally designated as Safety Climate items plus one item originally considered to be a Self-efficacy item. Principal axis factoring of the nine retained items (Table 11) resulted in two factors that jointly explained about 56% of common item variance (42% and 14%, respectively). All item communalities were at least .45, and cross-loadings were minimal. As would be expected based on the initial results, the two reverse-scored items loaded together as the second factor. In addition to their reverse scoring, these two items both represent a negative influence of economic pressure that represents more of a negative pole of Safety Climate than a separate dimension.

Table 11. Rotated Factor Matrix Year 2 pre-test following item reduction, Participants and Controls (N = 193).

	Factor		Communalities	
	1	2	Initial	Extraction
We take time…to make sure worksite…as safe as possible before starting (PRE31)	**0.821**	0.292	0.70	0.76
Supervisor[s]... communicate that keeping safe is as important as getting the job done (PRE32)	**0.771**	0.262	0.66	0.66
Experienced workers take time to show less experienced…the safest way to get a job done (PRE33)	**0.751**	0.239	0.57	0.62
I feel capable of making good decisions about what safety equipment is needed….(PRE34)	**0.711**		0.50	0.54
I take the time to plan out what is necessary to do a job safely (PRE28)	**0.694**		0.47	0.51
Supervisors & employees freely share their concerns & ideas about safety on the job (PRE29)	**0.666**	0.249	0.49	0.50
Everyone works together as a team to make work conditions safe (PRE27)	**0.643**		0.43	0.45
Financial pressures keep companies like ours from doing things as safely as possible (PRE18)[a]		**-0.702**	0.29	0.53
Financial pressures keep me from doing things as safely as possible (PRE35)[a]	-0.212	**-0.634**	0.28	0.45
Initial Eigenvalues Total	4.83	1.12		
% of Variance	53.63	12.42		
Rotation Sums of Squared Loadings Total	3.76	1.27		
% of Variance	41.78	14.07		
Cumulative %	41.78	55.85		
Cronbach's *a* for primary loadings	0.90	0.66		
Cronbach's α for all 9 items	0.89			

Primary loadings > |.40| in boldface type; Loadings < |.20| not shown

[a] Reverse-scored items

For the 9 retained items (possible score range 9 to 54 scale points), there was no PRE difference between intervention participants and controls on the total score or on subscale scores for either Factor 1 (Theoretical Range 7 to 42) or Factor 2 (Theoretical Range 2 to 12). Among intervention participants, the difference between total PRE versus DPT scores was small (equivalent to ~ 0.25 *SD*), with only borderline statistical significance, primarily due to a difference on the two item Factor 2 subscale (Table 12).

Retrospective Pre-test (RPT)

As indicated in Table 9, the three VAS items were administered to intervention participants as a pre-test (PRE) and immediate post-test (IPT) concurrently with the intervention, and approximately four months later as concurrent delayed post-test (DPT) and retrospective pretest (RPT). In the PRE, IPT, and DPT, each item was administered in a 'now' version (i.e., "...right now....;"). On the follow-up survey (DPT and RPT), each VAS item was presented in two versions: DPT ("How you think things are right now," with item stems preceded by, "At the present time"); and (b) RPT ("How do you now think that things were four months ago," with item stems preceded by, "I would say now that four months ago"). For the RPT, item stem verbs were converted to the appropriate past tense. Control subjects were administered only the PRE and RPT versions of the VAS items.

In an initial principal axis factor analysis together with the Likert-scaled items, the three VAS items loaded together as a single factor, probably as a scaling artifact. One of the VAS items (PRE15) detracted from the internal consistency of the other two and, on that basis was dropped. This questionable item had a bi-polar VAS (Totally Disagree to Totally Agree), whereas the other two (i.e., PRE13 and PRE14) were unidirectional (Never to At All Times...). Internal consistency of the two remaining items (Safety Climate and Self-efficacy) was strong at all testing periods (Cronbach's α = .78 for PRE, .88 for IPT, . 82 for DPT, and .78 for RPT). Concurrent validity of treating these two items as a scale was supported by the fact that among the Likert-scaled items, one of the Self-efficacy items (PRE34) loaded together with the (positive) Safety Climate items on Factor 1 (see Tables 7, 8, and 9). Therefore, in the following analyses, the mean for the two retained VAS items was used (e.g., PRE13 and PRE14; IPT1 and IPT2; DPT21b and DPT 22b, and RPT21a and RPT22a for intervention participants, and Control survey items 13 and 14 [PRE] and 36 and 37 [RPT] — see Appendix G).

As with the 9 retained Likert-scaled items, there was no significant difference between intervention participants and controls in the 2-item VAS PRE mean score. Among intervention participants with PRE and DPT scores on both items, the difference in 2-item VAS means for PRE were approximately 5 mm higher (*SD* ~ 13 mm) than for DPT, t (59) = 2.98, p = .004 (i.e., a modest effect, ~0.38 *SD*, in a direction *not* favoring treatment). However, results such as this are not unexpected when an intervention potentially influences subjective judgments of scale calibration or construct definition (i.e., beta or gamma change, respectively; Golembiewski et al., 1976; Howard, 1980). Given the similarity between PRE and DPT in terms of factor structure for the nine items retained for the Safety Climate measure, we had no reason to suppose that subjects had undergone any meaningful conceptual redefinition of Safety Climate (i.e., gamma change), at least as operationalized by this measure. Therefore, attention was directed to the issue of beta change.

Table 12. Paired analysis of PRE and DPT scores in Intervention group (n = 62).

Measure	PRE	DPT	r	Paired Difference Mean (SD) [df]	95% CI for Difference
Safety Climate scale (9 items; Range 9 to 54[a])	39.9 (11.9)	42.8 (6.8)	.40[b]	2.8 (11.1) [61]	(0.01, 5.64)†
Factor I (7 items; Range 7 to 42)	33.2 (6.5)	33.1 (5.7)	.69	0.10 (4.9) [57]	(-1.39, 1.18)
Factor II (2 items; Range 2 to 12)	8.9 (2.5)	9.6 (2.0)	.56	0.74 (2.2) [61]	(0.19, 1.29)**
2-item 100mm VAS Mean (in mm; Range 0-100)	86.9 (11.7)	81.8 (14.0)	.48	-5.1 (13.3) [59]	(-8.5, -1.7)**

[a] Theoretical range in arbitrary scale units
[b] All correlations $p \leq .001$
† $p \sim .05$, ** $p < .01$

Under the plural change framework, before concluding that a small or nonexistent score difference between pre- and post- measures actually signifies a lack of change, one needs to test the difference between RPT and PRE scores for evidence of a response shift consistent with a beta change. This analysis is most easily illustrated graphically via comparisons of means, mean differences, and corresponding confidence intervals for intervention participants and controls.

There was no difference between intervention participants and controls in the PRE 2-item VAS mean (Figure 1). However, the 2-item VAS mean for intervention participants on the DPT was significantly less than the PRE score for controls (Figure 2) or for all intervention participants (Figure 1). RPT values for controls (Figure 3) were virtually identical with their PRE scores (Figure 1 or Figure 2), whereas for intervention participants, RPT scores (Figure 3) were significantly lower than either their PRE (Figure 1) or DPT (Figure 2) scores. Figure 4 shows that, for intervention participants, there was no difference in PRE versus IPT scores (top bar) hence, no evidence of any immediate 'propaganda' effect of the intervention and no apparent disposition to alter ratings to 'please' intervention developers. As noted in Table 12, among intervention participants, DPT scores were marginally lower than PRE scores, whereas RPT scores were much lower than PRE scores (second vs. third bars from top in Figure 4).

The RPT versus PRE difference (3rd bar from top in Figure 4) serves as an index of the degree of beta change. This was on the order of 12 mm (*SD* = 16.5 mm; i.e., 12% of scale range or a substantial effect size, on the order of .7 *SD*). Having demonstrated a response shift consistent with beta change, the argument based on the plural change typology would be that the appropriate index of change in the intervention subjects would be the DPT versus RPT difference (Figure 4, bottom bar) which was significantly greater than zero (~7 mm, *SD* = 12 mm, for a modest effect size ~ .6 *SD*). In contrast, the RPT minus PRE difference for controls was not significantly different from zero (2nd bar from bottom in Figure 4). We concluded that there was sufficient evidence of a response shift to warrant performing a full retrospective pretest in Year 3 on the revised safety climate measure (i.e., having an RPT version of every item).

The following changes were made to the Safety Climate measure for Year 3: (a) we did not use VAS scaling; (b) all items were converted to a Likert-type subjective frequency scale; (c) all items were to be administered as PRE and RPT for all subjects, and as IPT and DPT for intervention participants; (d) we made minor modifications to the stems of a few items; and (e) we added one item: "*The possible financial consequences of an injury make me work as safely as I know how*." The rationale for this item was to help determine whether Factor 2 actually represented a distinct economic dimension of Safety Climate (in which case, the new item should load primarily on Factor 2). Alternatively, if Factor 2 was primarily a scaling artifact that depended upon reverse scoring, the new item would likely load with Factor 1. The 10 Safety Climate items used in Year 3 are shown in Table 13.

Figure 1. 2-item VAS mean score for PRE Intervention (n = 138) vs. Control (n = 47).

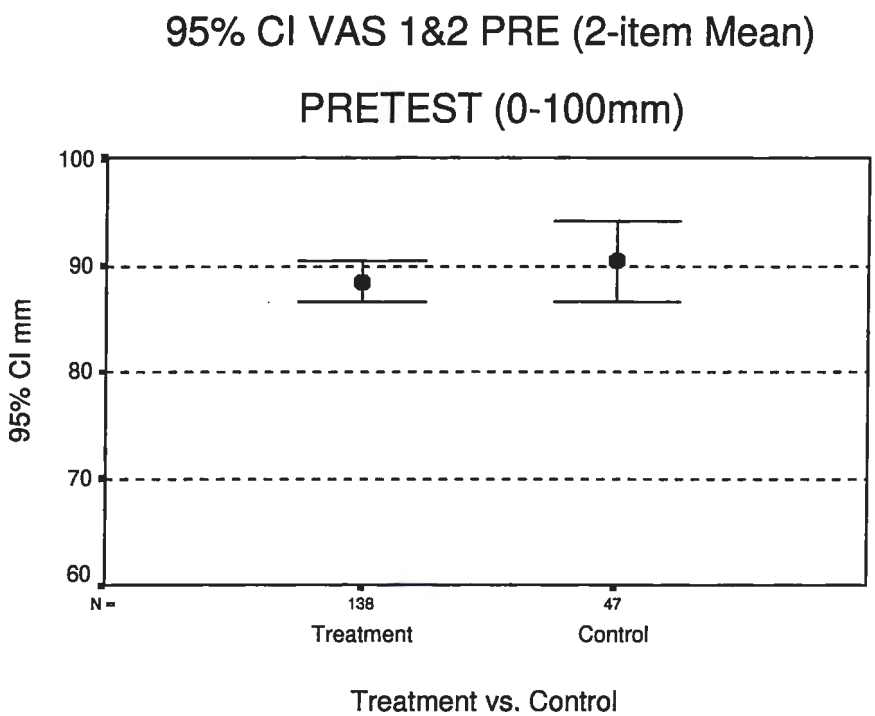


Figure 2. 2-item VAS mean score for DPT Intervention (n = 63) vs. PRE Control (n = 47).

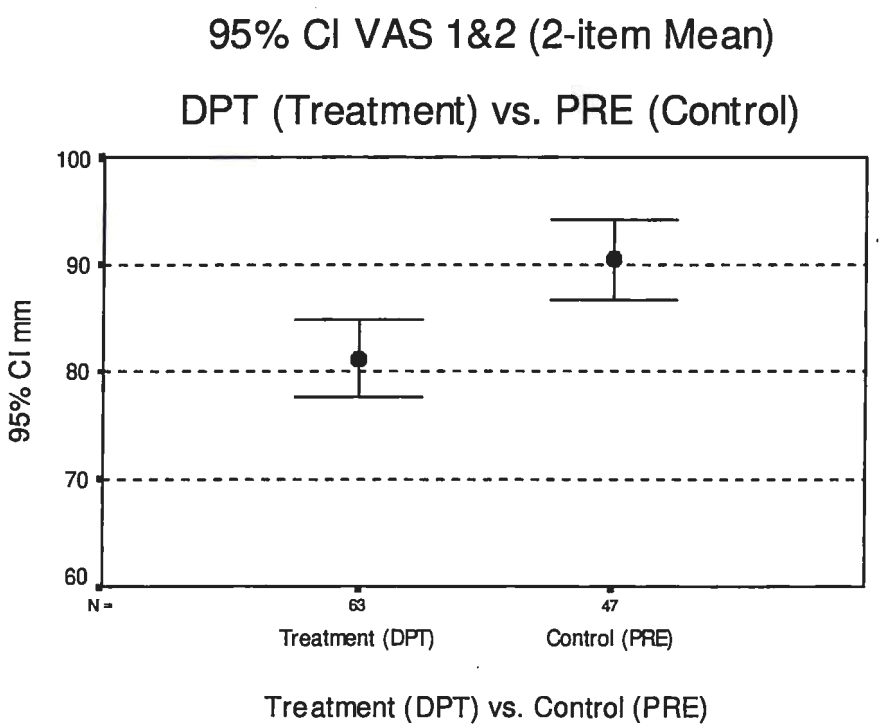


Figure 3. 2-item VAS mean score for RPT Intervention (*n* = 63) vs. Control (*n* = 47).

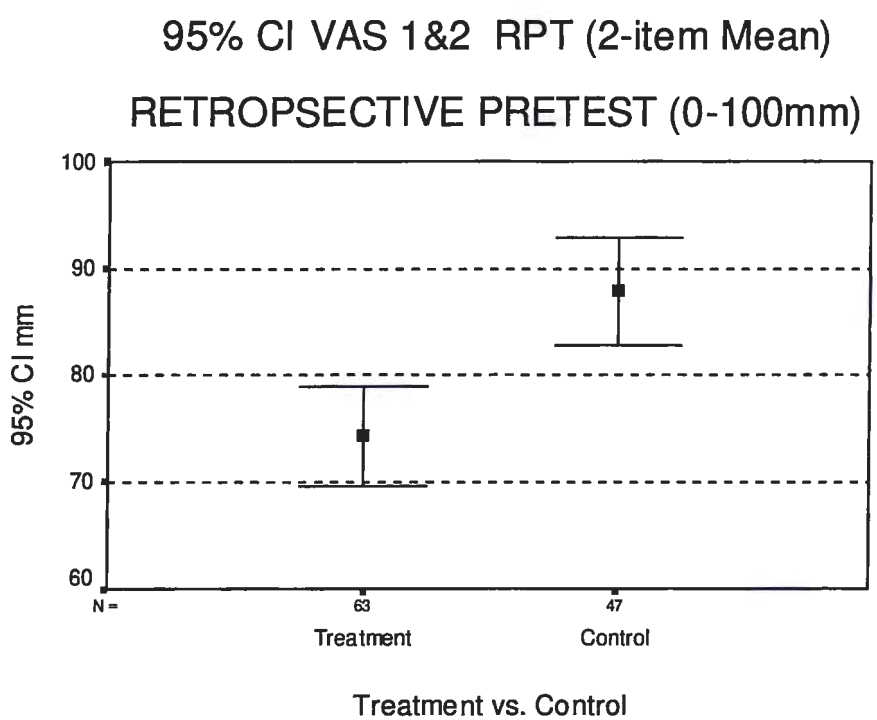


Figure 4. 2-item VAS mean score differences Intervention (*n* varies by analysis) vs. Controls (*n* = 47).

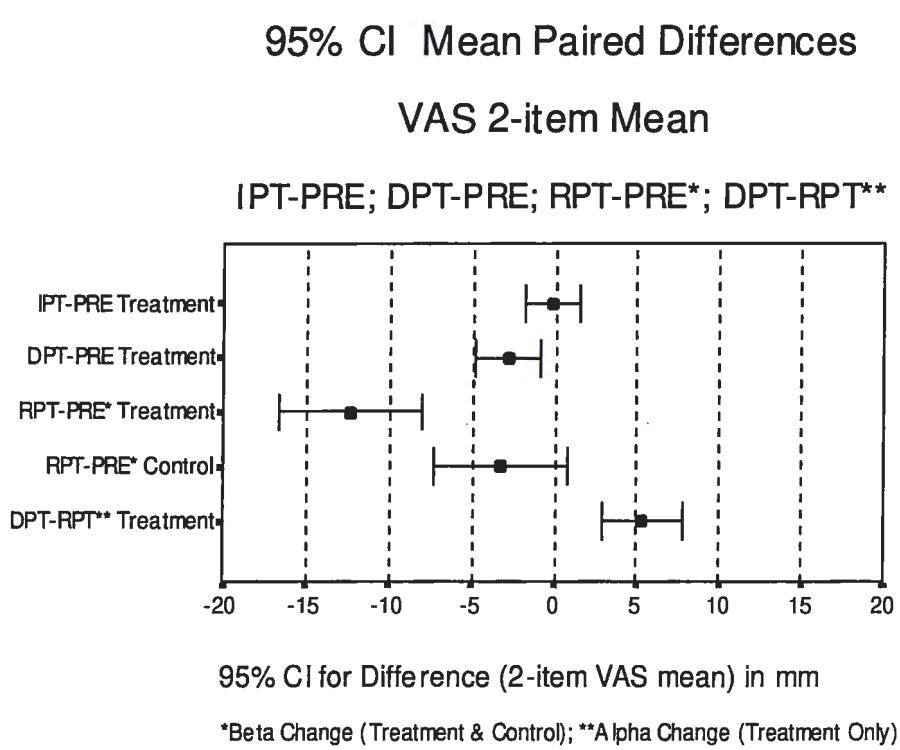


Table 13. Year 3: Item Stems, Scale Type, and Expected Factors for Revised 10-item Measure of Safety Climate.

Item Stem and Scale Type	Expected Factor and Scale Anchors
Item Number[b] and Stem Likert Type Scales	Frequency (1 = Hardly Ever; 6 = Almost Always)
1. Financial pressures keep me from doing things as safely as possible. [R]	Factor 2
2. Experienced workers in our company take time to show less experienced workers the safest way to do the job.	Factor 1
3. The possible financial consequences of an injury make me work as safely as I know how.	New Item (See Text)
4. Where I work, we take the time and trouble to make the work site as safe as possible before starting any job.	Factor 1
5. We make good decisions at work about what equipment is needed to get the job done safely.	Factor 1
6. Supervisors and employees in our company freely share their concerns and ideas about safety on the job.	Factor 1
7. In our company, everyone works together as a team to make work conditions safe.	Factor 1
8. Supervisors in our company communicate that keeping safe is as important as getting the job done.	Factor 1
9. Financial pressures keep our company from doing things as safely as possible. [R]	Factor 2
10. Employees in our company feel that doing the job safely is as important as getting the job done.	Factor 1

All items administered as Pretest (PRE) and Retrospective Pretest (RPT) to all subjects in Year 3 Control).
For Intervention participants only, all items also administered as Immediate Post-Test (IPT) and Delayed Post-test (DPT).
Testing intervals and wording of instructions for RPT as in Year 2 measure (Table 6).

Phase 2 (Year 3): Fall Simulations (Home Administration)

Procedures

In Year 3 a new database for sampling was constructed because of substantial numbers of new policies, cancellations, and non-renewals. All previously selected companies were omitted. KEMI then reviewed the remaining companies to remove any without current policies and added all new policies. The new sampling database contained 1660 companies which were randomly assigned, half to an Intervention sampling frame (Home Administration) and the other half to a Control sampling frame. Five hundred companies were randomly selected from the Intervention sampling frame and 200 from the Control sampling frame for solicitation to participate. In addition, we sent out simulation packets to every individual from whom we received any usable returns in Year 2 (n = 146).

Methods

Because participation was less than hoped for in Year 2, we added a specific aim for examining reasons for participation and non-participation. Surveys for non-participation were sent to company owners who said that they would participate in Years 2 and 3 but never returned materials. Questions regarding reasons for participation were added to the immediate post-test. Also, on the advice of consultants, we added two questions to the demographic section of the pretest questionnaire in Year 3 that pertained to close calls. All Year 3 survey questionnaires can be found in Appendix H.

Results

Participation

In Year 3, 146 individuals from 73 companies that participated in Year 2 received home administration packets (Table 14). In addition, another 436 companies were invited by mail to participate in home administration. In all, there were 159 individual returns from 92 companies in Year 3. Four of the returns were not usable due to incompleteness. The recruitment for Intervention, Control, and Agree no Return participation is shown in Table 14.

The most frequently reported reasons for not participating in Years 2 and 3 were: "Time involved too much for me" (52% in Year 2, 47% in Year 3); and "Company already has good safety record" (52% in Year 2, 60% in Year 3). The most important reason for not participating was "Time involved too much for me" (39% in Year 2, 40% in Year 3). Hardly any respondents (n = 2) indicated any concern that the incentive was inadequate or that the intervention materials did not appear sound or worthwhile. In Year 3, we also surveyed to discover reasons for participation. The most frequently selected reasons for participating were "Will get insurance discount" (80%) and "Safety is a priority for our company" (68%). Evidently, the belief that a company's safety record was already good could be used by owners to justify either participation or non-participation.

Table 14. (a) Recruitment for Year 3 Intervention participation.

	# of Companies Invited By Mail	# Companies Sent Intervention	# of Individual Interventions Sent	# of Companies Returning Intervention	# of Individual Interventions Returned	Initial # of Follow-Up Surveys Returned	Reminder Cards Sent	Final # of Follow-Up Surveys Returned
Year 2 Participants	73	73	146	18	26	6	20	17
HOME	436	247	573	74	133	12	121	43
TOTAL	509	320	719	92	159	18	141	60

(b) Recruitment for Year 3 Control participation.

	# Companies Invited By Mail [a]	# of Follow-Up Surveys Returned [b]
CONTROLS	183	25
AGREE NO RETURN	172	20
TOTAL	355	45

[a] One anonymous survey was cent to each company owner.
b Represents the total numbers of surveys returned after reminder cards sent.
Due to the anonymity of the surveys one thank you/reminder card was sent to all.

Fall Injury Simulations

Demographics

Demographic analyses for the sample in Year 3 were substantially similar to findings in Year 2 in that differences between intervention participants and controls primarily reflected the fact that Control subjects were all owner-operators whereas the intervention group consisted of owner-operators and employees (who, by and large, were younger and less experienced). A summary of demographic findings for Year 3 is in Table 15.

Table 15. Year 3: Age, education, and work experience/hours by groups ($N = 198$).

		N	Mean		SD	SE	95% Conf. Interval for Mean		ANOVA	SS	df	MS	F	p ≤
							Lower	Upper						
AGE	PARTICIPANT—OWNER/SUPERVISOR	108	42.1		11.0	1.1	40.0	44.2	Between	3267.5	3	1089.2	9.08	0.001
	PARTICIPANT—EMPLOYEE	46	33.8	***	11.5	1.7	30.4	37.2	Within	23280.6	194	120.0		
	CONTROL—OWNER	25	45.8		11.7	2.3	41.0	50.7	Total	26548.2	197			
	AGREE NO RETURN—OWNER	19	44.1		8.3	1.9	40.1	48.0						
	Total	198	40.8		11.6	0.8	39.2	42.5						
EDUCATION	PARTICIPANT—OWNER/SUPERVISOR	108	13.1		4.4	0.4	12.3	13.9	Between	104.8	3	34.9	2.66	0.049
	PARTICIPANT—EMPLOYEE	46	11.4	*	2.1	0.3	10.8	12.1	Within	2546.5	194	13.1		
	CONTROL—OWNER	25	13.4		2.6	0.5	12.4	14.5	Total	2651.3	197			
	AGREE NO RETURN—OWNER	19	12.8		2.2	0.5	11.7	13.9						
	Total	198	12.7		3.7	0.3	12.2	13.2						
EXPERIENCE (YEARS IN CONSTRUCTION)	PARTICIPANT—OWNER/SUPERVISOR	108	20.9		11.0	1.1	18.8	23.0	Between	6158.7	3	2052.9	19.22	0.001
	PARTICIPANT—EMPLOYEE	44	8.8	***	8.0	1.2	6.4	11.3	Within	20616.0	193	106.8		
	CONTROL—OWNER	25	25.3		12.0	2.4	20.4	30.3	Total	26774.7	196			
	AGREE NO RETURN—OWNER	20	22.4		9.1	2.0	18.1	26.7						
	Total	197	18.9		11.7	0.8	17.3	20.6						
HOURS/WEEK	PARTICIPANT--OWNER/SUPERVISOR	107	40.8		12.3	1.2	38.4	43.2	Between	1895.4	3	631.8	4.85	0.003
	PARTICIPANT--EMPLOYEE	46	34.9	**	10.9	1.6	31.7	38.1	Within	25115.9	193	130.1		
	CONTROL--OWNER	24	44.5		9.5	1.9	40.5	48.5	Total	27011.3	196			
	AGREE NO RETURN--OWNER	20	42.7		9.3	2.1	38.3	47.0						
	Total	197	40.1		11.7	0.8	38.4	41.7						
YEARS AT PRESENT COMPANY	PARTICIPANT--OWNER/SUPERVISOR	105	9.1		8.1	0.8	7.5	10.7	Between	1548.7	3	516.2	8.78	0.001
	PARTICIPANT--EMPLOYEE	46	3.3	***	3.5	0.5	2.3	4.4	Within	11294.3	192	58.8		
	CONTROL--OWNER	25	11.8		10.4	2.1	7.5	16.1	Total	12843.1	195			
	AGREE NO RETURN--OWNER	20	9.5		8.3	1.8	5.6	13.4						
	Total	196	8.1		8.1	0.6	7.0	9.3						

* $p < .03$ vs.each group except agree-no return (ns)

** $p < .01$ vs. each other group

*** p <= .003 vs. each other group

[a] $p < .02$ vs. participant owner/supervisors

Simulation Performance

Simulation performance data at the question level are shown in Table 16 (cf. Table 6). Item analyses are presented in Table 17 (cf. Table 7). Item discrimination data are presented in Table 18 (cf. Table 8). General issues pertaining to the interpretation of question, item, and discrimination data have already been discussed in relation to Year 2 analyses. In Year 3 only one item in any simulation discriminated negatively (Deck Dilemma, Question C, Item 16, see Table 17b). The question pertained to consequences of a fractured wrist; the item suggested that addiction to pain medication was a possible outcome (see Appendix D). In our judgment, this is unlikely, hence endorsing this item was incorrect. Only 30% of the sample endorsed the item. Therefore we do not believe the item was confusing. Although the item discriminated negatively at a $p < .01$ level, the negative correlation ($r = -.22$) was relatively weak. Given the large number of correlation coefficients generated in the discrimination analysis, this may have been a chance finding.

Simulation Evaluation

Simulation evaluation scores in Year 3 (Table 19) showed modest increases on the applicability to work subscale for each of the simulations relative to Year 2 (cf. Table 9). However, this translated into only a marginal overall improvement in evaluation scores (about 2 percentage points on average), and the applicability to work scores in Year 3 remained lower than the scores for realism or exercise quality.

Safety Climate

Internal consistency of the revised 10-item safety climate instrument was high (Cronbach's $\alpha = .89$ on the PRE [Appendix I] for all intervention participants and controls). As expected, results of principal axis factor analysis showed two factors, and all 9 items that were carried over from Year 2 had strong primary loadings on the same factor as in Year 2 (Table 20; cf. Table 11). The newly added item (PRE 3: *The possible financial consequences of an injury make me work as safely as I know how*) loaded primarily on Factor 1 with a negligible loading (< .20) on Factor 2. This item was designed to tap economic ramifications of safety without reverse-scoring. Therefore, we believe the solution suggests that the Factor 2 does not represent a discrete dimension of safety climate (or a true subscale). Instead, the consistent loading of the two reverse-scored items on Factor 2 (in all administrations over both years) more likely represents a scaling artifact. Therefore, Safety Climate scores were calculated as the total for all 10 items, not by factors. Table 20 shows the factor analytic results on the PRE for Year 3 because this was the only measurement that included all intervention participants and controls. However, factor analytic results on the Safety Climate measure were substantially the same for all measurements during Year 3, indicating that a gamma change (concept redefinition) had not occurred in virtue of participation in the intervention (Golembiewski et al., 1976; Terborg et al., 1980).

Table 16. Year 3 Fall injury narrative simulations (3): Performance results and psychometric summaries.

	Mean	*SD*	*SEM*	Mode	Skewness	Kurtosis	Percentiles 25th	Median	75th	$r_{(Ques/Tot)}$
UP ON THE ROOF (*N* = 159; *n* = 158; Standardized alpha = .55)										
QUESTION A	89.87	14.94	1.19	100	-1.55	3.13	75	100	100	0.34
QUESTION B	91.45	18.02	1.43	100	-2.76	8.02	83	100	100	0.36
QUESTION C	91.13	17.41	1.39	100	-1.85	2.59	100	100	100	0.29
QUESTION D	80.38	20.00	1.59	100	-0.74	-0.37	60	80	100	0.33
QUESTION E	80.38	20.00	1.59	100	-0.74	-0.37	60	80	100	0.26
TOTAL SCORE	87.84	10.53	0.84	100	-1.62	3.74	83	90	95	
DECK DILEMMA (*N* = 159; *n* = 158 to 159; Standardized alpha = .63)										
QUESTION A	89.78	17.16	1.36	100	-1.64	2.11	75	100	100	0.24
QUESTION B	73.79	16.07	1.27	83	-0.69	1.19	67	67	83	0.45
QUESTION C	79.06	14.27	1.13	86	-0.46	-0.03	71	86	86	0.35
QUESTION D	72.80	20.16	1.60	75	-0.50	0.31	50	75	75	0.41
QUESTION E	78.61	13.57	1.08	80	-1.15	2.42	80	80	80	0.47
TOTAL SCORE	78.80	10.33	0.82	85	-1.32	3.24	74	81	85	
OFF TO A LATE START (*N* = 159; *n* = 158 to 157; Standardized alpha = .68)										
QUESTION A	92.50	13.50	1.07	100	-2.20	5.25	83	100	100	0.61
QUESTION B	93.99	14.51	1.15	100	-2.70	7.48	100	100	100	0.41
QUESTION C	74.52	24.26	1.94	75	-0.86	0.41	50	75	100	0.29
QUESTION D	95.06	13.70	1.09	100	-3.86	19.10	100	100	100	0.44
TOTAL SCORE	89.05	11.65	0.93	100	-1.97	5.01	85	92	100	
Pooled Score	85.2	8.9								

Table 17. Item analyses for simulations #4, #5 and #6: Answer (item) means, standard deviations, difficulties,* and corrected item-total correlations ($r_{ans/tot}$).†

(a) Simulation #4: UP ON THE ROOF (n = 158; KR-20 = .65).

Item	Sign	Mean	*SD*	Difficulty	$r_{ans/tot}$	$p <$
A01	+	0.98	0.14	0.98	-.04	(ns)
A02	+	0.75	0.43	0.75	.18	.05
A03	+	0.97	0.18	0.97	.24	.01
A04	-	0.11	0.31	0.89	.26	.01
B05	-	0.06	0.23	0.94	.40	.01
B06	-	0.07	0.26	0.93	.51	.01
B07	-	0.05	0.22	0.95	.55	.01
B08	-	0.23	0.42	0.77	.30	.01
B09	+	0.99	0.11	0.99	.06	(ns)
B10	-	0.09	0.29	0.91	.51	.01
C11	-	0.20	0.40	0.80	.15	(ns)
C12	+	0.99	0.11	0.99	.13	(ns)
C13	-	0.06	0.23	0.94	.43	.01
D14	+	0.93	0.26	0.93	.23	.01
D15	-	0.28	0.45	0.72	.16	.05
D16	-	0.37	0.48	0.63	.16	.05
D17	-	0.19	0.39	0.81	.31	.01
D18	+	0.93	0.26	0.93	.25	.01
E19	+	0.96	0.19	0.96	.17	.05
E20	-	0.04	0.21	0.96	.32	.01
E21	+	0.85	0.35	0.85	.12	(ns)
E22	+	0.68	0.47	0.68	.07	(ns)
Mean Item Difficulty				0.88		

Table 17. (Continued)

(b) Simulation #5: DECK DILEMMA (n = 158; KR-20 = .53).

Item	Sign	Mean	*SD*	Difficulty	$r_{ans/tot}$	$p <$
A01	-	0.03	0.16	0.97	.27	.01
A02	-	0.23	0.42	0.77	.23	.01
A03	+	0.98	0.14	0.98	.25	.01
A04	-	0.13	0.34	0.87	.07	(ns)
B05	+	0.96	0.19	0.96	.32	.01
B06	+	0.96	0.21	0.96	.39	.01
B07	+	0.38	0.49	0.38	.10	(ns)
B08	-	0.21	0.41	0.79	-.01	(ns)
B09	+	0.52	0.50	0.52	.31	.01
B10	-	0.18	0.38	0.82	.08	(ns)
C11	+	0.96	0.19	0.96	.38	.01
C12	-	0.38	0.49	0.62	.22	.01
C13	+	0.89	0.32	0.89	.27	.01
C14	+	0.53	0.50	0.53	.28	.01
C15	+	0.94	0.23	0.94	.49	.01
C16	-	0.30	0.46	0.70	-.22	.01
C17	+	0.89	0.32	0.89	.35	.01
D18	+	0.88	0.33	0.88	.14	(ns)
D19	+	0.86	0.35	0.86	.39	.01
D20	-	0.33	0.47	0.67	-.10	(ns)
D21	+	0.51	0.50	0.51	.28	.01
E22	+	0.95	0.22	0.95	.32	.01
E23	+	0.91	0.29	0.91	.42	.01
E24	+	0.87	0.34	0.87	.29	.01
E25	+	0.94	0.24	0.94	.33	.01
E26	-	0.73	0.44	0.27	.21	.01
Mean Item Difficulty				0.78		

Table 17. (Continued)

(c) Simulation #6: OFF TO A LATE START (n = 157; KR-20 = .68).

Item	Sign	Mean	*SD*	Difficulty	$r_{ans/tot}$	$p <$
A01	+	0.91	0.29	0.91	.45	.01
A02	+	0.92	0.28	0.92	.49	.01
A03	+	0.95	0.22	0.95	.45	.01
A04	-	0.08	0.27	0.92	.18	.05
A05	+	0.92	0.28	0.92	.30	.01
A06	-	0.06	0.24	0.94	.03	(ns)
B07	-	0.06	0.24	0.94	.28	.01
B08	-	0.13	0.33	0.87	.30	.01
B09	-	0.03	0.18	0.97	.26	.01
B10	+	0.98	0.14	0.98	.45	.01
C11	+	0.79	0.41	0.79	.39	.01
C12	+	0.85	0.36	0.85	.12	(ns)
C13	-	0.36	0.48	0.64	.09	(ns)
C14	+	0.71	0.46	0.71	..23	.01
D15	+	0.96	0.19	0.96	.67	.01
D16	+	0.97	0.16	0.97	.50	.01
D17	-	0.11	0.32	0.89	.08	(ns)
D18	+	0.98	0.14	0.98	.38	.01
Mean Item Difficulty				0.89		

* Because all individual items are dichotomous (selected = 1 and not selected = 0), the item mean is the proportion of persons who selected the item. For items marked with a '+' sign in column 2, the mean (proportion) in Column 3 is identical to the item difficulty, i.e., the proportion who answered correctly (Column 5). For items marked with a '-' sign in column 2, the mean (proportion) endorsing the item (Column 3) is the complement of the item difficulty (Column 5). Also, for a fixed sample size, the standard deviation (*SD*) for any binary proportion is a constant, thus it does not really convey unique information not contained in the mean.

† Corrected item-total correlations calculated after reverse-scoring all items with negative signs in Column 2.

Table 18. Item discrimination: Percentage of exercise items that correlated with exercise total score positively ($p < .01$ or $p < .05$ criterion) or not at all[a] for three Fall injury simulations ($n \geq 157$).

Exercise	Criterion	Positive	No Relationship[b]
Up on the Roof	$p < .01$	55% (12 items)	
22 items	$p < .05$	73% (16 items)	27% (6 items)
Deck Dilemma	$p < .01$	73% (19 items)	
26 items	$p < .05$	73% (19 items)	23% (6 items)
Off to a Late Start	$p < .01$	72% (13 items)	
18 items	$p < .05$	78% (14 items)	22% (4 items)

[a] Only one item on any simulation discriminated negatively (Deck Dilemma, C16; see Table 15b and Appendix D).

[b] i.e., $p > .05$ ($r \leq |.16|$)

Table 19. Summary of Year 3 evaluation results for three Fall injury/protection simulations: Mean subscale and total scores and variability normalized to percentage of maximum.

Simulation Title Subscale	Mean	*SD*	*SEM*	Percentile 25th	 Median	 75th	Cronbach's α
UP ON THE ROOF (n = 153)							
Applicability to Work(10 items)	81.62	17.12	1.38	69	86	98	0.94
Realism (4 items)	86.80	15.04	1.22	80	90	100	0.80
Quality (5 items)	87.71	11.80	0.95	80	92	100	0.71
Total Evaluation (20 items)	84.99	12.43	1.00	77	88	96	0.93
DECK DILEMMA (n = 156)							
Applicability to Work(10 items)	82.42	17.16	1.37	72	86	100	0.96
Realism (4 items)	86.89	14.20	1.14	80	90	100	0.80
Quality (5 items)	87.28	12.02	0.96	76	88	100	0.73
Total Evaluation (20 items)	85.05	12.97	1.04	77	88	97	0.94
OFF TO A LATE START (n =151)							
Applicability to Work(10 items)	85.51	15.91	1.29	78	90	100	0.96
Realism (4 items)	89.27	13.69	1.11	85	95	100	0.84
Quality (5 items)	87.13	12.46	1.01	76	92	100	0.71
Total Evaluation (20 items)	86.75	11.78	0.96	78	90	97	0.93
Pooled Score	85.5	11.7					

Table 20. Rotated factor matrix Year 3 pre-test, Participants and Controls (N = 195; α = .89).

	Factor		Communalities	
	1	2	Initial	Extraction
PRE7: Everyone works together as a team to make work safe	**0.796**	0.210	0.63	0.68
PRE6: Supervisors and employees freely share concerns and ideas about safety	**0.763**		0.56	0.60
PRE10: Employees feel that doing the job safely is as important as getting the job done	**0.697**	0.298	0.60	0.57
PRE5: We make good decisions at work about equipment	**0.671**	0.325	0.53	0.56
PRE8: Supervisors communicate that keeping safe is as important as getting the job done	**0.668**	0.211	0.51	0.49
PRE4: We take the time and trouble to make the work site safe	**0.602**	0.328	0.52	0.47
PRE3: Financial consequences of injury make me work safely	**0.593**		0.40	0.36
PRE2: Exp workers take time to show less ex workers safest way to do job	**0.565**	0.308	0.45	0.41
PRE1: Financial pressures keep me from doing things safely[a]		**-0.722**	0.26	0.53
PRE9: Financial pressures keep our company from doing things safely[a]	-0.266	**-0.543**	0.31	0.37
Initial Eigenvalues Total	4.892	1.139		
% of Variance	48.92%	11.39%		
Rotation Sums of Squared Loadings Total	3.714	1.325		
% of Variance Variance	37.14%	13.25%		
Cumulative % Explained Variance	37.14%	50.39%		
Cronbach's α for primary loadings	0.890	0.600		
Cronbach's α for all 10 items	0.890			

Primary Loadings > |.40| in boldface tyepe; Loadings < |.20| not shown

[a] Reverse-scored items

Retrospective Pre-test

In Year 3, there was no overall difference in Safety Climate PRE scores (possible range: 6 to 60) among intervention participants who were owner operators or employees, controls, or owner-operators who agreed by phone to participate but from whose companies no returns were received. There also was no difference between those groups in RPT scores (Table 21).

Among intervention participants in Year 3, there was no paired difference between the PRE and IPT scores, and there was no difference on either measure between participants who completed the follow-up measures four months later ($n = 55$) and those who did not ($n = 97$). Among participants, the proportion of employees who completed the follow-up measures (~20%) was substantially less than the proportion of owner-operators (~46%).

Unlike Year 2, there was no paired difference between PRE and RPT scores, hence no evidence of a response-shift (beta change). Accordingly, the appropriate difference score for assessing a treatment effect was the difference between DPT and PRE scores (Terborg et al., 1980). DPT scores were not significantly different from PRE scores among participants who completed both measures (mean paired difference, +1.2 points from PRE to DPT, $t_{(54)} = 0.99$, p =.33). Because the Year 2 measure used for the RPT consisted of the mean score for 2 VAS items, its reliability ($\alpha = .78$ for both the PRE and RPT) was lower than the reliability of the 10-item scale used in Year 3 ($\alpha = .89$ for the PRE and .94 for the RPT). Thus, there was no evidence in Year 3 that the intervention had any effect on safety climate. However, results in both Year 2 and Year 3 suggested that safety climate ratings were generally high to begin with, and that safety climate was a relatively stable characteristic in participating companies over an interval of approximately 4 months.

Table 21. Safety Climate total scores (possible range 6-60) on PRE and RPT by group and employment status.

	N	Mean	SD	ANOVA	*SS*	*df*	*MS*	*F*	*p* =
PRE TOTAL SCORE									
PARTICIPANT–OWNER/SUPERVISOR	106	53.20	7.07	Between	103.80	3	34.60	0.74	0.53
PARTICIPANT--EMPLOYEE	46	54.28	6.70	Within	9047.33	193	46.88		
CONTROL--OWNER	25	53.04	5.39	Total	9151.13	196			
AGREE NO RETURN--OWNER	20	55.30	7.55						
Total	197	53.64	6.83						
RPT TOTAL SCORE									
PARTICIPANT--OWNER/SUPERVISOR	49	52.29	8.46	Between	140.72	3	46.91	0.84	0.47
PARTICIPANT--EMPLOYEE	9	53.78	7.16	Within	5506.12	99	55.62		
CONTROL--OWNER	25	53.36	4.94	Total	5646.84	102			
AGREE NO RETURN--OWNER	20	55.40	7.52						
Total	103	53.28	7.44						

Close Calls

In Year 3, a question pertaining to close calls was added to the demographic portion of the pre-test questionnaire. The item stem was:

> On average, how often are you in a 'close call' situation for an on-the-job injury. By 'close call,' we mean any situation or event that, *in your opinion,* could easily result in an injury bad enough to miss at least one day of work.

Response options ranged from *less than once a year* to *at least once a week.*

Among intervention participants who responded to this question on the pretest, the median fell between *at least once* and *less than three times a year.* The modal response class was *less than once a year* (45%; $n = 67$). Percentages for other responses are shown in Table 22. There was no difference between employees ($n = 43$) and supervisory personnel (including owners, $n = 106$) in self-reported frequency of close calls. There also was no significant difference between the pre-test ratings of close calls and either immediate or delayed post-test ratings. However, close calls were not one of the themes emphasized in the simulations.

Among Controls and owners in the 'Agree no Return' subgroup who responded to this question, the median and modal response class were *less than once a year* (63%; $n = 26$). Percentages for other response classes are shown in Table 23. There was no difference between control group and 'agree-no return' owners in frequency of self-reported close calls. Taken together, these two groups reported a significantly lower frequency of close calls compared to all Intervention participants or supervisory personnel (including owners) among the Intervention participants (Mann-Whitney test, $z \approx -2.00$, $p \approx .045$ in either case). However, there was no difference between the 'agree-no return' owners and supervisory personnel (including owners) in the Intervention group, so perceptions of owners as to their personal exposure to close calls evidently did not figure into non-participation.

Among all respondents, the mean years of experience in construction was approximately 19. The modal response category for close calls was *less than once a year* (48%; $n = 93$); the median fell between *at least once* and *less than three times a year.* Approximately 47% of all respondents reported ever having had an injury that required either medical treatment or missing at least one day of work. Of interest, those who reported ever having had an injury requiring medical treatment or lost time ($n = 91$) reported a higher frequency of close calls (Median = *at least once* but *less than three times a year*) compared to those who reported never having an injury of that severity ($n = 100$; Median = *less than once a year*; Mann-Whitney test, $z = -3.15$, $p = .002$). Approximately 8% of all respondents ($n = 15$) reported having had such an injury in the last year. Those who reported an injury in the last year also reported a higher frequency of close calls (Median = *at least three* but *less than six times a year*) than those who did not ($n = 176$; Median = less than once a year; Mann Whitney test, $z = -2.12$, $p = .03$). Thus, ever experiencing an injury may sensitize workers to close calls (e.g., a somewhat lower threshold for labeling situations as close calls when asked), and this tendency was more pronounced when the injury was recent.

Table 22. Frequency of Close Calls for Intervention participants.

Response	#	%	Cumulative #	Cumulative %
Less than once a year	67	45	150	100
At least once a year	28	19	83	55
At least three times a year	23	15	55	37
At least six times a year	6	4	32	21
At least once a month	11	7	26	17
At least twice a month	5	3	15	10
At least once a week	10	7		

Table 23. Frequency of close calls for Controls.

Response	#	%	Cumulative #	Cumulative %
Less than once a year	26	63	41	100
At least once a year	5	12	15	37
At least three times a year	5	12	10	24
At least six times a year	1	2	5	12
At least once a month	1	2	4	10
At least twice a month	3	7	3	7
At least once a week	0	0		

Claims

We examined claim records from the inception of KEMI in 1995 until May 1999. Over this period there were a total of 291 workers' compensation claims from 176 companies recorded from the initial sampling pool of 1166 randomly selected small construction companies (i.e. all companies that were eligible for Intervention or Control groups). Of all claims, 17.5% were injuries to the back and 27.5% were the result of falls. The number of claims for companies that completed the Intervention, were invited but did not complete the Intervention, and the Control group are shown in Table 24

The most frequently reported claims (Figure 5) were back (51), eye (28), lower leg (27), and finger (23). According to the reported SIC codes for companies with at least one claim during the query period most companies were general contractors of single family homes (42), carpentry (18), excavation (18), electrical and plumbing/heating/air (17), and Roofing/Siding/Sheet Metal (15).

Due to the time constraints of the project we were only able to look at the pre/post claims differences for Year 2. A summary of the pre- and post-intervention claims is shown in Table 25. There were not an adequate number of cases in the pre- and post-intervention time frame for any meaningful inferential analysis of a treatment effect on claims.

The total cost of these claims, which includes medical costs, worker's compensation paid, medical rehabilitation costs, vocational rehabilitation costs, and claims management expense, was $1,522,946. For a breakdown of these costs by group and type of injury refer to Table 26. For the same time period as the claim query KEMI collected an estimated $7,328,047 in policy premiums.

There were no significant differences in the number or cost of claims between Intervention participants and Controls over the entire claims history. In addition, there were no differences in the average amount of claims paid for the different SIC classifications. Statistical analysis (ANOVA with Fisher's Least Significant Difference Post Hoc test) revealed no significant differences in the totals paid between back and all other claims or between back and fall claims. However, fall claims that occurred from greater than 6 feet (M = $10,242, SD = $17,151) cost significantly more than all other claims (M = $4395, SD = $12,187) ($p$ = .01) as well as claims that involved falling while on the same level (M = $1514, SD = $2515) ($p$ = .02).

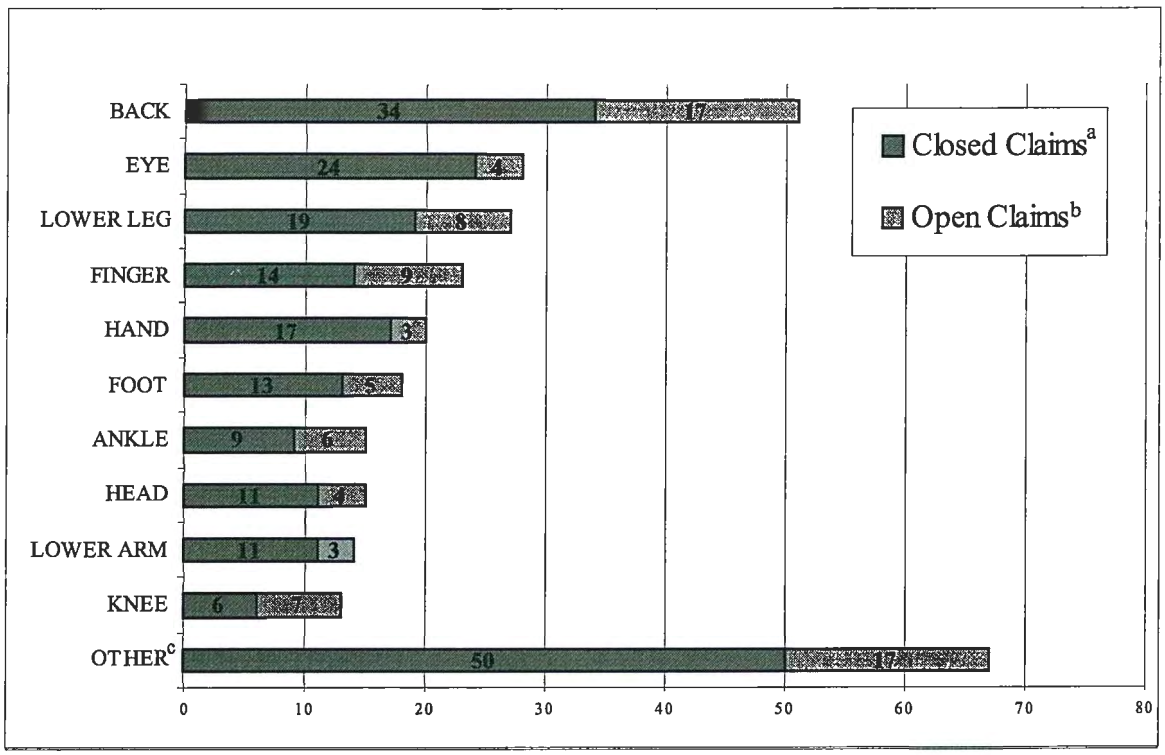
The experience modification rating (EMOD) was not a good indicator of the safety risk of these companies. In order for a company to be experience rated they must pay more than $3000 in Workers' Compensation premiums. Since we targeted smaller companies, only 5.7% of companies with claims in our sample had an EMOD greater than 1.000, whereas 10.8% had an EMOD less than 1.000 indicating, respectively, companies with greater than average or less than average injury risk.

Table 24. Claims cost summary between 1/95 – 5/99 for companies that completed the Intervention, were invited but did not complete the Intervention, and the Control groups.

	# of Companies	# (%)Companies w/ Claims	# of Claims	Medical Costs	Worker's Comp.	Medical Rehab	Claim Total*
ALL CLAIMS							
Intervention Completed	147	25 (17)	61	$129,855	$91,529	$2,839	$235,762
Intervention not completed	631	93 (15)	148	$337,942	$237,249	$24,896	$640,036
Controls	388	58 (15)	82	$304,466	$275,907	$24,889	$647,148
TOTAL	1166	169 (14)	291	$772,263	$604,685	$52,624	$1,522,946
BACK CLAIMS							
Intervention Completed	147	3 (2)	7	$7,064	$1,069	$0	$9,058
Intervention not completed	631	26 (4)	27	$98,418	$80,837	$4,990	$197,843
Controls	388	16 (4)	17	$21,344	$71,251	$1,044	$110,458
TOTAL	1166	45 (4)	51	$126,826	$153,157	$6,034	$317,359
FALL CLAIMS							
Intervention Completed	147	8 (5)	12	$22,577	$21,857	$0	$46,679
Intervention Not Completed	631	38 (6)	43	$141,372	$86,917	$16,217	$258,975
Controls	388	22 (6)	25	$161,620	$105,234	$12,029	$289,844
TOTAL	1166	68 (6)	80	$325,569	$214,008	$28,246	$595,498

*Claims Total also includes vocational rehabilitation and claims management expenses.

Figure 5. Frequency of injured body part by status of claim.



[a] Closed claims have been finalized and are no longer accruing charges.
[b] Open claims could still accrue additional charges.
[c] Includes nose, teeth, facial soft tissue, facial bones, upper arm, elbow, wrist, thumb, chest, hip, thigh, shoulder, neck, abdomen, groin, and multiple body parts.

Table 25. Claims cost summary by participation group and injury type.
(a) Pre-intervention period claims summary.

	# of Companies	# of Claims		Medical Costs	Worker's Comp.	Medical Rehab	Claim Total*
ALL CLAIMS							
Intervention Completed	73	7	SUM	$4,278	$3,531	$0	$11,969
			MEDIAN	$365	$345	$0	$2,306
			MEAN	$611	$504	$0	$1,710
Intervention Not Completed	270	17	SUM	$16,287	$720	$0	$19,437
			MEDIAN	$117	$0	$0	$216
			MEAN	$958	$42	$0	$1,143
Controls	206	13	SUM	$107,570	$80,063	$10,023	$209,176
			MEDIAN	$656	$0	$0	$821
			MEAN	$8,275	$6,159	$771	$16,090
BACK CLAIMS							
Intervention Completed	73	2	SUM	$1,751	$1,460	$0	$5,328
			MEDIAN	$1,751	$1,460	$0	$5,328
			MEAN	$1,751	$1,460	$0	$5,328
Intervention Not Completed	270	1	SUM	$0	$0	$0	$380
			MEDIAN				
			MEAN				
Controls	206	3	SUM	$1,914	$0	$0	$2,954
			MEDIAN	$656	$0	$0	$1,036
			MEAN	$638	$0	$0	$985
FALL CLAIMS							
Intervention Completed	73	1	SUM	$989	$1,289	$0	$2,658
			MEDIAN				
			MEAN				
Intervention Not Completed	270	6	SUM	$14,066	$720	$0	$16,166
			MEDIAN	$59	$0	$0	$289
			MEAN	$2,344	$120	$0	$2,694
Controls	206	4	SUM	$1,320	$0	$0	$1,500
			MEDIAN	$330	$0	$0	$375
			MEAN	$440	$0	$0	$500

Table 25. Claims cost summary by participation group and injury type.
(b) Post-intervention period claims summary.

	# of Companies	# of Claims		Medical Costs	Worker's Comp.	Medical Rehab	Claim Total*
ALL CLAIMS							
Intervention Completed	73	3	SUM	$5,254	$4,380	$0	$15,985
			MEDIAN	$611	$504	$0	$2,306
			MEAN	$1,751	$1,460	$0	$5,328
Intervention Not Completed	270	29	SUM	$44,058	$16,625	$472	$63,714
			MEDIAN	$205	$0	$0	$295
			MEAN	$1,519	$573	$16	$2,197
Controls	206	12	SUM	$15,713	$10,569	$0	$27,423
			MEDIAN	$379	$0	$0	$622
			MEAN	$1,309	$881	$0	$2,285
BACK CLAIMS							
Intervention Completed	73	0	SUM				
			MEDIAN				
			MEAN				
Intervention Not Completed	270	6	SUM	$10,252	$9,992	$472	$21,495
			MEDIAN	$312	$0	$0	$423
			MEAN	$1,709	$1,665	$79	$3,583
Controls	206	2	SUM	$660	$0	$0	$750
			MEDIAN	$330	$0	$0	$375
			MEAN	$330	$0	$0	$375
FALL CLAIMS							
Intervention Completed	73	1	SUM	$0	$0	$0	$0
			MEDIAN				
			MEAN				
Intervention Not Completed	270	8	SUM	$25,293	$8,688	$0	$34,752
			MEDIAN	$286	$0	$0	$376
			MEAN	$3,162	$1,086	$0	$4,344
Controls	206	2	SUM	$10,997	$7,802	$0	$19,190
			MEDIAN	$5,499	$3,901	$0	$9,595
			MEAN	$5,499	$3,901	$0	$9,595

*Claims Total also includes vocational rehabilitation and claims management expenses.

Table 26. Costs of claims summary by group and type of injury.

	# of Companies w/ Claims	# of Claims		Medical Costs	Worker's Comp.	Medical Rehab	Claim Total*
ALL CLAIMS							
Intervention Completed	25	61	SUM	$129,855	$91,529	$2,839	$235,762
			MEDIAN	$233	$0	$0	$353
			MEAN	$2,129	$1,500	$47	$3,865
Intervention Not Completed	93	148	SUM	$337,942	$237,249	$24,896	$640,036
			MEDIAN	$318	$0	$0	$594
			MEAN	$2,283	$1,603	$168	$4,325
Controls	58	82	SUM	$304,466	$275,907	$24,889	$647,148
			MEDIAN	$521	$0	$0	$1,003
			MEAN	$3,713	$3,365	$304	$7,892
BACK CLAIMS							
Intervention Completed	3	7	SUM	$7,064	$1,069	$0	$9,058
			MEDIAN	$250	$0	$0	$340
			MEAN	$1,009	$153	$0	$1,294
Intervention Not Completed	26	27	SUM	$98,418	$80,837	$4,990	$197,843
			MEDIAN	$668	$0	$0	$1,599
			MEAN	$3,645	$2,994	$185	$7,328
Controls	16	17	SUM	$21,344	$71,251	$1,044	$110,458
			MEDIAN	$656	$0	$0	$1,183
			MEAN	$1,256	$4,191	$61	$6,498
FALL CLAIMS							
Intervention Completed	8	12	SUM	$22,577	$21,857	$0	$46,679
			MEDIAN	$399	$0	$0	$484
			MEAN	$1,881	$1,821	$0	$3,890
Intervention Not Completed	38	43	SUM	$141,372	$86,917	$16,217	$258,975
			MEDIAN	$514	$0	$0	$1,012
			MEAN	$3,288	$2,021	$377	$6,023
Controls	22	25	SUM	$161,620	$105,234	$12,029	$289,844
			MEDIAN	$1,130	$1,112	$0	$2,437
			MEAN	$6,465	$4,209	$481	$11,594

*Claims Total also includes vocational rehabilitation and claims management expenses.

Costly Claims

In an attempt to gain more information about claims a subset of the more costly claims was analyzed. This subset consisted of 48 claims over the interval of 1995 – 1999 that had a claim total greater than $10,000 and/or greater than $5000 and still open. The total cost of these claims as of May 1999 was $1,234,879. This is not the final cost of these claims since 29% of these cases are still open and they may incur more cost. Of the 48 most costly claims, 11 (22.9%) were injuries to the back and 24 (50%) were due to falls. In addition, four of the back claims were a result of falls. Although the frequency of fall and back claims was relatively small, back and fall claims incurred a higher cost. The injured worker ranged in age from 18-60 years, all but one was male, and 60.4% were married. Claims in this subgroup analysis came from 6 companies that completed the Intervention, 26 that declined to complete the Intervention and 16 that served as Controls. The wages for these injured workers ranged from approximately $4.15 - $25 an hour. The nature of the injury was most frequently a fracture (22), strain (12) and/or contusion (6). The most frequently injured body part was the lower leg (15), multiple parts (7), lower back (6), and the ankle (5). The first reported time of injury was 8:15 a.m. and 37.5% of the injuries occurred before noon, 52.1% between noon and 5:00 p.m., and 4.1% at or after 5:00 p.m.

Conversion to Web-Based Simulations

Due to the concerns associated with the availability and cost of printing the latent image exercises the team decided to convert the simulations to a computer accessible format. The first step in this process was to decide which computer media to use for distribution of the simulations. Internet and CD-ROM were the two choices. After discussing the pros and cons of each media (Table 27) the Internet was selected. The differences between Latent Image and Web-Based simulation in development, distribution, training emphasis/pedagogical issues, and evaluation are highlighted in Table 28. Example pages for one of the web-based simulations has been included in Appendix J.

Table 27. Pros and Cons for use of Internet and CD-ROM for simulation exercises.

Internet		CD-ROM	
Pros	**Cons**	**Pros**	**Cons**
• Easy to update and make changes material • Material could be presented in a "slide show" format with audio that is similar to television • Easily accessible Becoming a popular training trend	• Security issues • User access • Registration • Difficulty in evaluating results	• Variety of Windows-based multimedia features	• Added complexity due to multimedia features • Changes in material would require CD's to be "re-burned" • Changes in material would make CD's in use outdated

Table 28. Differences between Latent Image and Web-Based simulation in development, distribution, training emphasis/pedagogical issues, and evaluation.

	Development	Distribution	Training Emphasis/ Pedagogical Issues	Evaluation
LATENT IMAGE	• Previously found effective in the mining and farming industries. • Disadvantage of a print format is exercise written at only one literacy level. Does not address variable literacy in a target population. • Graphics limited due to duplication costs.	• Easy to keep track of who received access to the materials. • Cost of reproducing the simulations. Now only possible to get this technology in large quantities (^{3} 5000). • Answer sheets are good for only one use.	• Simulations provide instant feedback when an answer is chosen. • Feedback was provided only for the answers the participant is choosing as "correct".	• Collecting evaluations required cost of postage or expense of having someone teaching the simulation collect evaluations. • Evaluation data had to be entered manually into the computer. • Scoring of the simulations done manually and entered into a computer for analysis.
WEB	• The flexibility of the internet allowed for the inclusion of graphics to enhance the flow of the narrative. • Able to incorporate optional audio. • Have the ability to make changes in the material quickly. • Clicking/scrolling associated with computer use minimized by formatting each story segment to fit on the screen.	• Necessary to have a registration process in order to keep track of who is using simulations. • Simulations were easy and inexpensive to distribute. • Participants could go through simulations multiple times. • Copyright needed to discourage unauthorized use.	• Delay in the feedback but feedback is received for all questions. • Necessary to agree/disagree with every question in a block before the answers are given. • Links to other sites on the internet increases access to safety information.	• Simulation evaluations are sent electronically and stored on a computer. • Able to provide a write-in comment option after each question block. • Simulations are electronically scored and automatically sent for storage on computer.

Discussion

Lessons Learned

The cooperation of the KY Employers Mutual Insurance Company (KEMI) for accessing small construction companies provided a unique avenue for reaching the "hard to reach". However, the research team thought that access and the monetary incentive (10% reduction in insurance premium) for participation would assure adequate participation rates. This turned out not to be the case. From the beginning of the study, recruitment was a problem – so much so that reasons for non-participation and participation became a secondary research question in Year 3. Recruitment dilemmas and potential solutions were presented at the American Public Health Association annual meeting in 1998.A manuscript that discusses these issues is in preparation.

A telephone survey was proposed to be used to follow-up participants over time. The research team greatly underestimated the amount of time it took to reach potential participants by phone. This became apparent in Year 1 when we were recruiting for focus group participants. Company owners work long hours and often there was no answer at the phone number listed in the insurance record despite multiple attempted contacts at different times of day. In addition, some companies had ceased operations, or were no longer insured by KEMI, by the time they were contacted, thus precluding participation. Because of these difficulties, we decided to use mail surveys rather than phone surveys for follow-up. Even so, participation rates remained a problem.

At the time of the proposal submission, our understanding was that Worker Compensation claims files at the Kentucky Department of Worker Claims (DWC) could be used to identify insurers. Although, the DWC does receive some raw data indicating the insurance carrier, they only report aggregate-level data on insurers. Insurer information is not included in their individual claims database. While it might, theoretically, have been possible to review raw data at the DWC, it would have been prohibitively expensive in terms of time, labor, and travel for study personnel. Therefore, comparison of claims data by insurer status (i.e., KEMI vs. other) was not possible.

We originally thought that we would be able to perform a cost effectiveness, cost-utility, and cost benefit analysis of the project. After consulting with our economist, Dr. Glenn Blomquist, we realize that this was too ambitious for the scope of the study. We did conduct a cost analysis. Please refer to the section, "Economic Implications" for a discussion of how economic issues should be explored in future studies of this nature.

Economic Implications

As noted above, we did not anticipate the need for or collect all the data that would be required to perform a cost-effectiveness evaluation. In addition, an intervention cannot be cost effective unless it is actually effective in achieving the desired outcomes. In the case of the present study, we did not find significant differences in safety climate, and did not have a sufficient number of back and fall claims to test inferentially. Therefore, this discussion is speculative in nature, that is, what steps would have been followed had evidence of effectiveness been found.

A cost effectiveness study should address several questions (Haddix & Shaffer, 1996) Our study design was not sufficient to answer all of these questions. However, for purposes of future research, these questions will be discussed within the context of the current study.

(1) What is the magnitude of the problem addressed by the intervention strategy?

There were 81,800 employees in 1997 (latest year for which the data were available) at risk for construction-related injuries in KY. It is more difficult to estimate how many of these may be employed by small construction companies with less than ten employees. Once an estimate is derived then this number is multiplied by the number of fatal and non-fatal work-related falls and the number of work-related back injuries. Based on KEMI data, and the figures used at the beginning of this study, we estimated that the total number of KEMI insured construction workers was 19,000, of whom we estimated 80% worked in small companies. These estimates translate into 19,000 X .08 = 15,200 workers in small construction companies insured by KEMI.

In this study the average cost of back and fall claims was $9598, and there were 115 such claims filed with KEMI from January, 1995 to May, 1999, for a total claims expense of $1,103,776 (Table 29). Fall and back injuries were aggregated to present a conservative estimation of the magnitude of the problem since in some cases a fall resulted in a back injury. Although these figures do not address the severity of injury and disability, they do indicate that the direct costs of back and fall injuries are considerable. Again, this is a conservative estimate because it does not take into account decreased productivity or quality from having to work short-handed or hire and train replacements.

Table 29. Cost of back (51) and fall (80, 16 of which were also back injuries) claims filed by 91 companies between 1/95 – 5/99.

Medical cost	$399,500
Medical Rehab	$322,221
Workers' Comp	$335,830
Claims Expense	$46,225
Total	$1,103,776

(2) *Can the intervention work (efficacy)?*

In essence, we conducted an effectiveness trial in a field setting without having first conducted an efficacy trial in a more controlled setting. Ideally, efficacy should first be tested in a pilot study because circumstances can be better controlled. If the intervention is successful in achieving desired outcomes under optimal conditions, then one can proceed to an effectiveness trail in which conditions and constraints on participation are more realistic. However, this ideal sequence was not practical given the nature of construction work (e.g., work does not take place in a fixed location), the heterogeneity of work types in small construction outfits, and as it turns out, the considerable difficulty in identifying and contacting potential eligible companies. Accordingly, the efficacy of the intervention is unknown in this population.

(3) *Did the intervention work? (effectiveness)*

We did not find evidence that the intervention was effective in reducing the number or amount of worker compensation claims of the specified types. However, claims experience for Intervention participants and in the Control sampling frame was much less than we anticipated. At the time the study was proposed, KEMI had only been in business for one year, and there were no data at our disposal that were specific enough to differentiate claims rates of smaller versus larger construction operations. Based on actual claims data accumulated over the life of KEMI, it is clear that a larger sample or longer time frame would be required to demonstrate a treatment effect on claims for this or any other intervention.

We also found no evidence of change in safety climate, possibly because this turned out to be a very stable characteristic in small construction firms. We did find that across employment status (i.e., employees, supervisory personnel, and owners), the simulations were evaluated quite positively. The high average level of construction experience among intervention participants in both years of Phase 2, suggests that the value of these simulations may reside more in communicating realistic information about the costs of injury and reinforcing positive safety practices than in changing safety climate in companies willing to participate.

In the present study we examined the frequency of close calls. Because these data were only collected in Year 3, and only at the pretest, evidence is lacking in terms of whether the intervention had an effect on close calls. However, we did find evidence that a past injury, especially if recent, appeared to be associated with a greater self-reported frequency of close calls. This suggests a sensitizing effect of injury on subjective thresholds for what constitutes a close call. Our data did not suggest the simulations had a similar sensitizing effect in this sample. However, the high degree of experience and high baseline ratings of safety climate may well have attenuated the impact of a vicarious exposure (i.e., via simulations) on close call ratings. In addition, as noted above, close calls were not among the themes emphasized in any of the simulations (see Table 2).

Our data also indicated that over an average interval of approximately 20 years (based on the mean years of experience), nearly half of all Year 3 respondents had, at some point in their career, experienced at least one injury severe enough to require medical attention or lost time from work. Using a median assumption about close calls, workers in small outfits might expect to experience at least one close call per person-year, and an overall 40 to 50% risk of injury for every 20 close calls (i.e., one injury for every 40 to 50 close calls). Given the high experience in the sample and the skew toward supervisory personnel (approximately 77% of all respondents in Year 3 were owners or supervisors), it is likely that these are conservative assumptions. This would translate into a risk of approximately 2.0 to 2.5% per close call. Thus, for a company with

10 employees including the owner, at a rate of one close call per worker per year, one would expect at least one injury severe enough to warrant a workers' compensation claim every 4 to 5 years. Alternatively, of approximately 15,000 individuals working for small construction companies insured by KEMI in any year, the expectation based on this analysis would be that 300 (2.0%) to 375 (2.5%) would get injured severely enough to require medical attention or at least one day of lost time.

A total of 1166 companies were invited to participate in the Intervention (n = 778) or serve as Controls (n = 388) in either Year 2 or Year 3. We have claims data on all 1166 companies. For all companies that requested intervention materials in either year (regardless of whether or not they actually participated) the average number of packets requested was approximately 2.5 per company. If that average is applied across the board, then our 1166 companies represent approximately 2900 workers, or approximately 1/5 of the estimated 15,000 employees of small construction outfits insured by KEMI. Over approximately a four-year period, the total number of claims of any kind in our 1166 companies was 291. Since 1/5 of all workers over 5 years is arithmetically equivalent to all workers in one year, our 291 injuries appears to be a reasonable estimate for how many injuries to expect in a year among 15,000 small construction company employees insured by KEMI (a rate of 1.9% per year). Accordingly, the estimates based upon the close call data appear to be realistic. The slightly higher estimate based on our close call data may be due to a somewhat more sensitive threshold in our definitions for close calls and injuries (missing at least one day of work) compared to the threshold for a compensable claim (workers' compensation does not become active until 7 days are missed from work). Although KEMI attempts to encourage employers to report any injuries, our focus group and some simulation performance data suggest that employers are reluctant to turn in claims on relatively minor injuries out of concern that higher premiums will ensue.

(4) *What are the benefits and harms of the intervention strategy worth?*
To assess benefits and harms several aspects need too be addressed including: audience and perspective, alternative intervention strategies, time frame and analytic horizon, opportunity costs of illness and disability, discounting, and sensitivity analyses.

Audience and Perspective

For this study the perspective of the employer was taken. Therefore the costs of the intervention were calculated using "lost work time" related to participation *if* the safety training had been conducted during work hours. The benefits addressed were injuries averted and decrease in actual number of injury events. Increases in worker compensation insurance premiums could not be assessed and compared with injury data because company policy numbers change frequently usually due to letting the policy lapse due to non-payment. Once lapsed, a new policy is written with a new number. There is no master list that includes company name and the different policy numbers accrued over time. Though not planned for or addressed in the present study, future studies should assess the value employers versus workers place on fatality and injury risk. What are employers willing to pay (in terms of safety training) and what is the cut off value from their perspective in terms of returns? How many injuries, and of what severity are they willing to tolerate as a function of "doing business"? Scenarios need to be developed that allow employers to choose options that would explain what degree of workers' compensation insurance premium increases are acceptable.

Alternative Intervention Strategies

Currently there is no "standard" safety training used by small construction companies. Thus for the current study it was assumed that the simulation exercises were preferable to no safety training.

Time Frame and Analytic Horizon

The simulation exercises were designed to be administered once. Because they are 'story-based", once administered, the reader knows how the story ends. Because the simulation exercises have not been examined for their benefits over time, it is assumed that similar to other educational interventions, the effects may last for 12 months. For example, OSHA mentions a time for refresher training in one of its standards (hazardous waste), as being required yearly. In addition there are two studies that showed through follow-up interviews at three, nine, and twelve months that knowledge did not decline overtime (DHHS, 1998; Latham & Frayne, 1989; Brown & Nguyen-Scott, 1992).

In the present study, safety climate was stable for Intervention participants in either year, as well as for the small sample ($n = 26$) who participated in both years and completed all six simulation exercises. However, when comparing the safety climate between Years 2 and 3 they rated their safety climate higher in Year 3. There was a mean difference in safety climate of 7.6 ($p = .004$) between pre-test scores as well as a 7.3 difference ($p = .028$) between post-test scores. If a positive impact of safety training in relation to injury events had been identified (i.e. injuries were reduced for a one year period), the consequences of these averted injuries should be considered over time (to at least the expected years of life of the average-age construction worker).

Opportunity Cost of Illness or Disability

To assess these costs comprehensively, data should be examined for direct medical costs, non-medical costs, and indirect costs associated with lost productivity. We assessed these costs to the degree possible based on the available data. Table 17 lists these costs by category. For this study we assumed that the cost of injury with safety training would be no different than the cost of injury without safety training. This is a conservative perspective since it is possible for example, if one cleaned up the clutter on the worksite (a safety behavior stressed in the simulation exercises in this study) and still experienced a fall, the injury might be less severe.

Discounting

When a one-year time frame is used for the analytic horizon, no discounting is necessary. In this study, it was assumed that inflation was stable and would affect both benefits and costs in the same manner, in essence producing no net effect.

Sensitivity Analyses

Sensitivity analysis for the discount rate is not important for short term effects (i.e. one year). Therefore it would not be calculated in the present study.

A possible benefit from the intervention in this study is a "diffusion" effect whereby the trainee may benefit from applying aspects learned from the simulation exercises m in other life activities. For example, sizing up a job and cleaning up clutter when performing chores around the house, or pacing oneself while driving.

(5) *What does the intervention strategy cost?*

The costs of the intervention were calculated without considering "spill-over"effects. Since the simulation exercises are now developed and they address safety behaviors applicable to all construction trades, they could be used as a safety training program in other states and internationally. Thus the costs of the intervention could also serve as the upper bound of a sensitivity analysis if the effect of the intervention was deemed to be longer than a year (determined through future evaluation studies). Costs associated with the intervention are located in Tables 30 and 31.

(6) *How do the benefits compare with the costs?*

This is expressed in dollars of net benefits (value of adverse health outcomes averted - cost of intervention). The net cost of the intervention was $221,194 (Tables 30 and 31). The total number of injuries that could theoretically be averted (assuming the intervention was 100% effective) was 1047. Of these 1047 potential injuries, 43% are assumed to be fall or back injuries based on the Kentucky Occupational Injuries and Illnesses Survey (Kentucky Labor Cabinet, 1997). Thus, as many as 450 fall or back injuries could be averted. Each fall or back claim averaged $9,598 for a total potential savings of $4,319,100. Theoretically, net savings of as much as $4,097,906 could be realized.

(7) *What additional benefits can be obtained with additional resources?*

Incremental analysis was not attempted in the current study since the training was not repeated at a regular interval over time. The costs and benefits of repeating the training need to be assessed and compared with the costs and benefits of offering the simulation exercises as a one time safety training program in a future study.

Marginal analysis was not conducted, since in the current study, there was no adaptation of the safety training program (simulation exercises) for the purpose of expanding the safety training to a different industry other than construction. However, since simulation exercises have been used in mining and agriculture successfully, it is conceivable that other industries could benefit from the intervention. The concepts stressed in the simulation exercises (e.g. clean up, coaching, pacing work etc.) are not unique to construction but failure to perform these activities could be viewed as potential injury precursors in a variety of industries.

Table 30. Costs associated with Year 1 development of six narrative simulation exercises.

FIXED COSTS	
Personnel	$89,572
Facilities	
Phone	$1,402
Office Furniture	$1,521
Supplies/Equipment	
Software	$1,454
Hardware	$2,620
Office Supplies	$508
Equipment	$931
VARIABLE COSTS	
Personnel	
Consultant	$3,068
Supplies/Misc.	
Travel	$2,373
Printing	$186
Duplicating	$53
Postage	$347
Auto Rental	$467
Library Supplies	$50
Meals/Refreshments	$1,479
Misc.	$958
TOTAL	$106,989

Table 31. Costs associated with Year 3 implementation of three narrative simulation exercises. (Sent 719 interventions out, only 159 were returned completed.)

FIXED COSTS	
Personnel	$80,505
Facilities	
Phone	$3,902
Rent	$3,820
Supplies/Equipment	
Software	$612
Hardware	$8,697
Office Supplies	$1,029
Equipment	$156
Dept Supplies	$334
VARIABLE COSTS	
Personnel	
Consultant	$3,000
Supplies/Misc.	
Printing	$450
Duplicating	$255
Postage	$2,811
Latent Image	$8,634
TOTAL	$114,205

Conclusions

The Intervention

There are no published studies that indicate how long simulation exercises remain vivid in memory or available for activation in support of desired or modeled behavior. Just as with a "good film or book, a good story can be recalled and used to trigger action. It may be that because most trainees were not learning new material but rather reinforcing existing knowledge or viewing safety principles in a new way, that scores on the measures and outcomes did not change significantly.

Both the Intervention and Control groups had low frequencies of workers' compensation claims. The Center to Protect Workers' Rights ([CPWR], 1998) summarized BLS data on nonfatal injury rates per 100 full-time equivalent workers in construction by company size (i.e., after the present study was underway). For small construction outfits (≤ 10 employees) the nonfatal injury rate was approximately half the rate for construction companies with 11 to 49 or 50 to 249 workers, and approximately two-thirds the rate for companies with 250 to 999 workers. Thus, it appears that smaller construction outfits may actually be safer overall than larger construction companies, despite being relatively less regulated. (Data on construction related fatalities by company size are not available in the CPWR document.) Based on our focus group data from Year 1 of the study as well as responses to our Safety Climate measure, we suspect that issues of organizational culture and climate (e.g., paternalism, loyalty, coaching, the owner's commitment to safety, and control over the amount and pace of work) may play an important role in workplace safety for small outfits.

We cannot preclude the possibility that the generally high ratings of safety climate in Intervention and Control participants may reflect some degree of social desirability bias. Arguing against that possibility, the Intervention group was assured that the insurance incentive was contingent only on participation, not on any particular responses. In addition, ratings of participants in the Intervention were returned directly to us. Therefore, Safety Climate ratings of non-supervisory employees were not known to owners and supervisory personnel. Nevertheless, safety climate ratings of non-supervisory employees in the Intervention group were very similar to the ratings of owners and supervisory personnel in the Intervention and Control groups. Viewed in this light, the low claims frequency in Intervention and Control subjects provides limited support for the concurrent validity of the Safety Climate measure. Further testing in larger samples with different levels of claims experience would be necessary to determine if the measure can truly discriminate between companies with better versus poorer safety records. Although designed primarily with small construction outfits in mind, we believe the Safety Climate measure may well have broader applicability across different work types and company sizes. However, we suspect that securing the participation of companies with poor safety records would likely prove difficult in any industry.

Based on the high level of construction experience in our Intervention group, it may have been unrealistic to expect substantial improvements in safety climate and claims as a result of this type of intervention. In particular, safety climate might be more appropriate for use as a predictor than as a dependent variable in this population. Nevertheless, we believe that the high level of experience in our sample justifies our assertion that members of the Intervention group were, in essence, content experts. Their simulation evaluation data indicated that they found the exercises realistic and well designed. It may be the case that the exercises were valued more as a

reinforcement of good safety practices than as a source of new knowledge or impetus for behavioral change.

The limited data we collected on close calls suggest a possible alternative for a dependent variable in occupational injury intervention studies. In particular, it might be worthwhile to investigate whether beliefs about the frequency or nature of close calls change in virtue of participation in a safety intervention.

The Sample

At the beginning of the study, KEMI was the "last resort" insurer for companies with a high EMOD rate or that were new enough to not qualify for an EMOD rating. Three years later, it is evident that the companies insured by KEMI are safe companies, and that KEMI is not losing money on policies written for small construction companies. In addition, several other companies are now writing worker compensation insurance in Kentucky for small companies with high or non-existent EMOD rates. Due to increased competition, KEMI's enrollment has dropped somewhat.

The literature suggests that most injuries occur in inexperienced workers (BLS, 1997, NIOSH, 1997, Dell & Berkhout, 1998). Although employees differed significantly from employers in years of experience, the employees still were very experienced in this study. This experience level may have moderated the impact of the intervention.

Limitations

KEMI's mission and commitment to loss education was a potential confound in this study. Companies insured by KEMI had a right to expect certain services (e.g., safety materials, site visits to assess work practices), and KEMI personnel had an obligation to provide them, regardless of whether or not companies participated in the intervention. Therefore it is possible that companies in both the treatment and control groups were "treated" with other safety interventions over the course of the study, and we can not assume that company owners who decided not to participate in our safety training program were not getting other assistance from KEMI. Participants were asked the number of safety training programs they had attended in the last year and there were no significant differences between the Intervention and Control groups on this variable.

Our data suggested that safety climate was a relatively stable characteristic in the companies we sampled over a relatively brief interval (4 months). However, there are no compelling longitudinal data on the stability of safety climate over longer intervals.

To look at pre/post intervention claims it would have been best to have a longer pre/post period to analyze. Due to the time constraints of the project we only had a very short post intervention period. It may also be helpful to identify companies with a past history of injury claims and target them as the Intervention group. Our focus group data also suggested that older more experienced owners fairly commonly reported having to learn over time how much work they can safely take on while maintaining their standards of quality. ***This suggests that younger, less experienced owners tend to take on more work than they can safely handle or supervise. Therefore, individuals who are making the transition from being a relatively experienced***

worker to being a relatively inexperienced owner might be a worthwhile group to target. It seems reasonable to suggest that interventions emphasizing the positive role that owners can play with respect to creating a climate in which quality work and safety are valued might be especially helpful for those who are just going into business for themselves.

KEMI's claims information is not in a format which allowed a timely extraction of valuable information. When a lost time injury claim occurs there are interviews conducted with the employer and employee. There is much more detailed information in these files. However it would have been too time prohibitive and costly to access this data since it would have had to be extracted form KEMI's system and manually re-entered in a program for analysis. Also, there is no discussion of functional status or quality of life in the claims reports thus it is not, at present, possible to draw any inferences about these variables based upon claims data.

In spite of several limitations that became apparent throughout the course of this project we feel we were able to uncover important useful information regarding safety training efforts in the small construction industry in Kentucky. The limitations identified through conducting this project will hopefully be over come by future research in this area. Most importantly, this project serves as a strong beginning for continued safety training research in the small construction companies. There is much that can be learned from this project that will assist others in more successfully completing safety training projects in this area.

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Appendices

A. Farm Safety Injury Model
B. Copy of Kidd & Parshall, 2000
C. Year 2 Back Simulations
D. Year 3 Fall Simulations
E. Year 2 Newsletters
F. Year 3 Newsletters
G. Year 2 Surveys
H. Year 3 Surveys
I. Safety Climate Tool
J. Web simulation

Publications

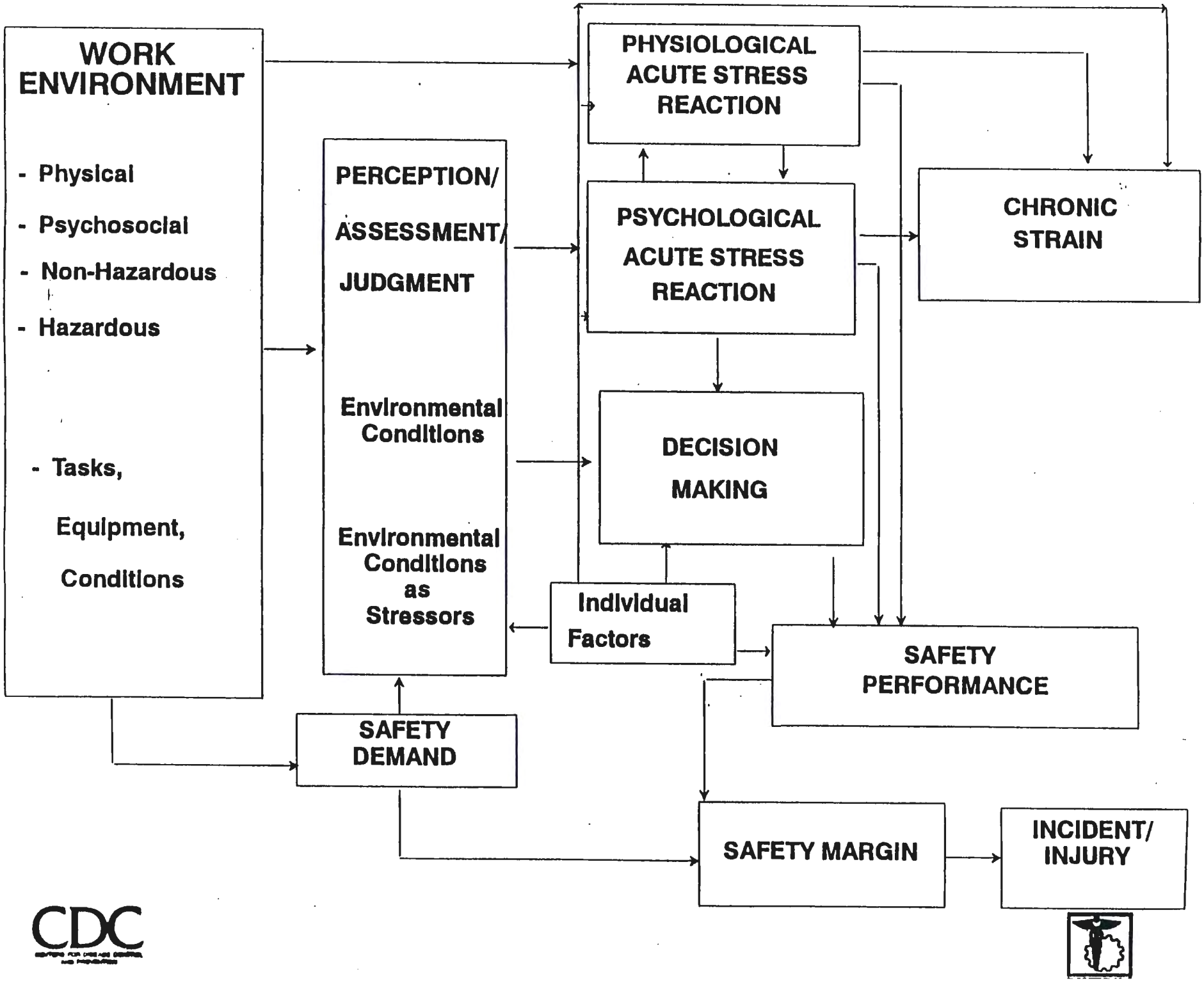
Present

Kidd, PS, Parshall, M: Getting the focus and the group: Enhancing analytical rigor in focus group research. Qualitative Health Research 10(3):293-308, 2000

Anticipated (Preliminary titles, order of authorship to be determined)

Development and testing of a safety climate tool for small construction companies.
Reliability and validity issues surrounding the use of simulations.
Recruiting workers in small construction companies for safety training.
Retrospective application of the NIOSH TIER model for evaluation of safety training.
The relationship between stress and injury in construction.
Using the retrospective pre-test for examining the effect of interventions.

Appendix A. Farm Safety Injury Model


WORK ENVIRONMENT
- Physical
- Psychosocial
- Non-Hazardous
- Hazardous
- Tasks,
Equipment,
Conditions
PERCEPTION/ ASSESSMENT/ JUDGMENT
Environmental Conditions
Environmental Conditions as Stressors
PHYSIOLOGICAL ACUTE STRESS REACTION
PSYCHOLOGICAL ACUTE STRESS REACTION
CHRONIC STRAIN
DECISION MAKING
Individual Factors
SAFETY PERFORMANCE
SAFETY DEMAND
SAFETY MARGIN
INCIDENT/ INJURY
CDC

Appendix B. Copy of Kidd & Parshall, 2000

Appendix C. Year 2 Back Simulations

Fact Sheet

Instructions Page

Problem Booklet, Answer Booklet and Master Answer Sheet for:

- **Bob's Builders**
- **Rogers' Remodeling**
- **Smitty's Dry Wall**

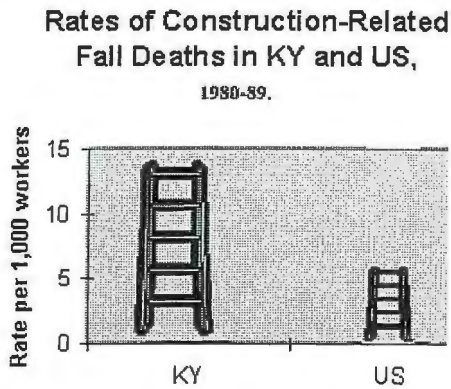
THE PROBLEM: CONSTRUCTION INJURIES IN KENTUCKY

Facts about construction injuries in Kentucky:

- The construction industry in Kentucky employed about 5% of the labor force, but accounted for 12.7% of work-related deaths (1994).

- Kentucky's construction industry had a higher number of persons injured per 100 full-time workers (11.7) than did either mining (10.8) or agriculture (11.4) (1994).

- Kentucky's rate of construction-related fall deaths for 1980-89 (14.1) was the second highest in the nation and was over two times the national average (6.2).



- Between 1994 and 1995 in Kentucky, a total of **127,734** lost work days resulting from construction injuries or illnesses were covered by workers' compensation. That's an average of **258** absent workers from construction worksites each workday for this period because of work-related injuries or illnesses.

Facts about the cost of construction injuries:

- The 127,734 lost work days that occurred between 1994 and 1995 resulted in **$87 million** paid out by the workers' compensation program. That averages out to almost **$170,00** each workday for this period.

- Workers' Compensation covers only 2/3 of an injured worker's average wage. So, if the injured worker makes $300 a week on average, workers' compensation will pay only $200 a week to that worker. In addition, benefits start only after missing 7 days of work due to a work-related injury or illness.

These figures point to the impact of construction injuries on the state and local economies. In this safety program, we hope to illustrate the impact of construction injuries on the economic survival of the small construction company and the well-being of the injured worker.

The Story-Based Safety Program

Congratulations! You are participating in a company safety program in the comfort of your own home. The program consists of a series of stories based on real-life situations described by construction workers in a variety of trades. You will get the most out of each story if you read them and answer the questions at home in a place where you won't be disturbed. You have one week to complete all the materials and mail them back to us. By completing each story and answering the questions, your company will receive a discount from Kentucky Employers' Mutual Insurance Company on its workers' compensation premiums. It is our hope that because you participated in this safety program, you will apply the lessons in the stories to your work and will perform your job more safely.

Complete the following six steps to participate in the program:

STEP 1: There are two copies of a form titled "Consent to Participate in a Research Study." Read one of them carefully. If you understand it and agree to participate in the program, sign both forms on the line of the last page which reads "Signature of Research Subject." Keep one copy for yourself. University of Kentucky regulations state that you must sign this form to participate in the program.

STEP 2: Complete the green survey form.

STEP 3: Work through the 3 stories by reading the problem booklet (yellow cover) and using the answer sheet (blue cover). To answer the questions in the problem booklet (yellow cover), look for the matching number on the answer sheet (blue cover). There are no words on the answer sheet, but there will be once you move your special marker between the brackets. Simply move your marker between the brackets for the number you want to choose and the text will appear. Be sure to highlight only the answers you choose and don't try to change your answers. Some questions ask you to choose as many as you think are correct and others ask you to pick the best answer, so read each question carefully. If words do not appear on the answer sheet once you have marked the areas between the brackets with your special marker, you can call 1-800-204-3223 and we will send you a new answer sheet.

STEP 4: Complete the pink survey.

STEP 5: Write your name, address, and phone number on the postcard. We need this in order to send you an answer sheet and a follow-up survey.

STEP 6: Use the addressed stamped envelope in the packet to return your signed "Consent to Participate in a Research Study" form, 3 answer sheets (blue covers), the green survey, the pink survey, the postcard, and the special marker to our office. Be sure to keep the story booklets (yellow covers) and a "Consent to Participate in a Research Study" form. We will send you a sheet with all the answers in the mail once we receive your packet.

This is not a test. It is not graded or timed. Work at your own pace. But it is VERY important not to read ahead until you have answered the questions in order for each section.

BOB'S BUILDERS EXERCISE

Problem Booklet

Simulation #1

Pamela Kidd
Tim Struttmann
Jonathan Mays
Mark Parshall

Occupational Injury Prevention Program
Kentucky Injury Prevention and Research Center
Kentucky Cabinet for Health Services, Department for Public Health
and University of Kentucky, Chandler Medical Center
Lexington, Kentucky[1]

December, 1997

[1] This latent-image exercise was developed under United States Department of Health & Human Services / United States Public Health Service / Centers for Disease Control & Prevention / National Institute of Occupational Safety and Health (NIOSH) Grant #5 RO1 CCR413067-02 to the Occupational Injury Prevention Program of the Kentucky Injury Prevention & Research Center, Pamela Kidd, Principal Investigator. The views and conclusions contained in this document are those of the authors and do not necessarily represent the official policies or recommendations of NIOSH, the University of Kentucky or any department or agency of the government of the United States or the Commonwealth of Kentucky.

Background

The Company

Bob started his block and foundation business as a way of having better control over his work. To start up his company he took out a $30,000 loan to purchase a truck, cement mixer, and scaffolding. His monthly loan payment is $500. He works out of his home but dreams of eventually having an office and expanding his operation to run two or three crews. However, Bob has lost three employees in the last two weeks. Two brothers who worked for him since he went into business quit to start their own company. They were his most experienced workers. The third employee, who had only been working for him for six months left last week for an extra dollar an hour with another company.

Bob has not been able to find a replacement for any of them yet. He's still hoping to find someone experienced, but would be willing to hire and train a less experienced worker if he can find someone he thinks will stay. Right now, his only employee is Fred.

The Employee

Fred has only been working for Bob for two months. Up until now he has just mixed and packed mortar. Fred makes $8.00/hour. He is single, lives with his parents and has a $180/month truck payment. He is sober, dependable, shows up on time, and does what he's told. Fred knows Bob wants to expand the business eventually. He always tries to show Bob that he's loyal and a hard-worker because he'd like to be a crew leader after learning the trade.

Jobsite

They are working in a subdivision with 30 new home sites. There are five footers already poured awaiting block. The houses are on crawl space foundations. The block, sand, and concrete were delivered to the job site two days ago.

The Current Situation

The loss of three workers in such a short time has really caused some problems keeping up with jobs that had already been bid. They are just starting this job after finishing another contract where they ran two days behind due to the employees leaving. Right now, it is just Bob and Fred. Up until the two brothers left, Bob had not been all that involved in training Fred. He buddied him up with the brothers, and they seemed to feel that he was coming along OK. At least until he can get some more help, Bob really needs to depend on Fred.

Bob and Fred arrive at the site and get set up. Bob hopes he won't have to deal with the general contractor today. He told the general contractor a couple of days ago that he would be starting the job later than originally planned. The general contractor let him know that he was unhappy with the delay.

Problem

It's Friday afternoon. Bob thinks they can get caught up if they work the weekend. He tells Fred that they are going to have to work Saturday. Fred had planned on going fishing this weekend after cashing his check. He knows that Bob is in a bind, and agrees to work Saturday. He thinks that maybe if he really hustles today they may not have to work all day Saturday and he may be able to get some fishing in afterwards.

About this time, the general contractor pulls up and says to Bob, "Hey! We are way behind, you gotta pick it up or I'll find someone else to lay this block."

Fred senses the pressure Bob is under and he wants to do what he can to help. He begins by mixing the mortar and distributing block faster than usual. Meanwhile Bob is laying the first row.

Fred's rushing is causing problems. He has broken seven blocks in the first hour. Pieces of block are scattered on the ground. He is not lifting properly and he is being careless in handling materials. Bob becomes upset when he notices all of the broken block. He sees Fred bending and twisting to throw the block. Bob has had a back injury in the past and he still has some lower back pain. Since that time he has learned proper ways to lift and handle materials.

Question A

What would be some good ways for Bob to deal with the situation?
(Choose as many as you think are correct.)

1. Holler to Fred, "Slow down, you're breaking too many blocks."

2. Stop work to tell Fred: "I want you to clean up the broken blocks and slow down some. Broken blocks cost me, and you can trip or twist your ankle on them."

3. Tell Fred, "That's how I hurt my back. If you keep lifting like that you are going to hurt your back, and I can't afford to lose you."

4. Tell Fred, "Keep up this pace and maybe you'll get to go fishing tomorrow after all."

Bob tells Fred to slow down and clean up the broken block, but continues to lay block as Fred is clearing out the broken pieces. Bob is thinking about how he's going to meet the contract deadline. He'd like to find some extra help, but so far the only people interested have been folks he didn't think would be dependable or have any sense.

Fred has cleaned up the work site. He has slowed down a little due to Bob's warning but he continues to twist as he throws the block.

Question B

What should Bob do now?
(Choose only one unless directed to "Try Again.")

5. Let Fred learn his lesson the hard way. If he has some soreness after getting warned, next time he'll know enough to listen better.

6. Ignore Fred's twisting. He's young and can get away with it without getting hurt.

7. Stop laying block to show Fred how to throw the blocks properly without breaking them or hurting his back.

8. Ignore Fred's twisting because he did slow down, which means he will be lifting less weight over a given time.

9. Remind Fred again to stop lifting like that.

Question C

It is Saturday morning. Bob is already at the work site when he receives a call from Fred on his cellular phone. Fred tells him, "Boss, I hurt my back. I thought I felt something pull yesterday near the end of the day. But I thought it would wear off after my shower. Now I can hardly get out of bed."

Bob tells Fred to go get his back checked out. In the meantime, Bob calls his insurance agent and lets him know that he may have a claim.

Fred finds out that he has a lower back muscle strain. He is given a prescription for pain medicine, and told to do no heavy lifting for a week. He can return to light duty after one week.

How might this injury affect Fred in the short or long run?
(Choose as many as you think are correct.)

10. He may have to deal with Bob feeling suspicious that he was just trying to get out of working the weekend.

11. Fred will have some financial losses.

12. Fred may not be able to do this type of work anymore.

13. He may get viewed as injury-prone and be denied workers' compensation.

14. There may be no light duty, so he may be off duty even longer than a week.

15. Even if he does return to work in one to two weeks, his risk of further injury or re-injury is increased.

16. Fred may get addicted to pain medication

Although Fred is a good worker, the thought did cross Bob's mind that he was just trying to get out of working the weekend. However, once Fred was diagnosed with a low back injury, Bob recalled how Fred had been twisting with his lifting, and he believed Fred's injury was legitimate.

The whole situation has put Bob in a real bind. The job was already behind schedule, and now he will have to hire and train someone else while Fred is on the mend. Bob asks the general contractor for a little more time. The general contractor says, "Forget it. I don't have time for you to hire and train a new crew. I'm going to get someone else to finish the job."

Question D
How might Fred's injury affect Bob's business?
(Choose as many as you think are correct.)

17. The reputation of Bob's Builders may suffer.

18. Bob may lose his business and have to go to work for someone else.

19. Bob's insurance premiums are sure to go up.

20. Bob will have the added cost of replacing Fred and training the replacement.

Question E

What could Bob and Fred have done to prevent the injury from occurring, or what could they do to keep a similar injury from happening in the future?

Choose as many as you think are correct

21. Fred could have asked Bob to show him how to throw the blocks properly.

22. In the future, Bob could demonstrate materials-handling and safe lifting to all new and inexperienced workers.

23. Bob could have made Fred wear a back support belt.

24. Fred could tell any new help about how his injury happened, and how pacing work and lifting properly can protect them.

25. When time pressure is on, Bob could remind his employees that doing things safely is still a priority because it will help everyone stay injury-free so they can get a full week's pay for a full week's work.

26. As soon as Bob realized how short-handed he was going to be, he could have called the general contractor to explain the situation.

BOB'S BUILDERS EXERCISE

ANSWER BOOKLET

Mark your answers in this booklet using the special marker.

Answer Sheet for the Bob's Builders Exercise

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose as many as you think are correct.)

1. [ ]
   [ ]
   [ ]

2. [ ]
   [ ]
   [ ]

3. [ ]
   [ ]
   [ ]

4. [ ]
   [ ]
   [ ]

Question B (Choose only one unless directed to "Try again")

5. [ ]
   [ ]

6. [ ]
   [ ]
   [ ]
   [ ]

7. [ ]
   [ ]
   [ ]

[ ]

8. [ ]
   [ ]

9. [ ]
   [ ]
   [ ]

Question C (Choose as many as you think are correct.)

10. [ ]
    [ ]

11. [ ]
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12. [ ]
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13. [ ]

14. [ ]
    [ ]

15. [ ]
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16. [ ]
    [ ]

[ ]

Question D (Choose as many as you think are correct.)

17. [ ]
    [ ]

18. [ ]
    [ ]
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19. [ ]
    [ ]
    [ ]

20. [ ]
    [ ]

Question E (Choose as many as you think are correct.)

21. [ ]
    [ ]
    [ ]

22. [ ]
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    [ ]

23. [ ]
    [ ]
    [ ]
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24. [ ]
    [ ]

25. [ ]
    [ ]

26. [ ]
    [ ]
    [ ]

[ ]

Finding your score for the multiple choice questions A - D

Count the number of correct answers you selected (all that begin with the word "Correct.")

Number "Correct" = _____ (Line 1)

Count the number of incorrect answers you selected. (Incorrect answers begin with some word other than "Correct.")

Subtract number Incorrect from 10. 10 - _____ = _____ (Line 2)

Add the numbers on Line 1 and Line 2 to get your total score = _____ (Line 3)
Highest possible score = 26 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the exercise.
Leave the completed questionnaire attached to this answer booklet.

Evaluation Form: *Bob's Builders*

Think about the story you just finished. Circle the number that best shows how much you agree or disagree with each statement.	Definitely No 1	2	3	4	Definitely Yes 5
1. This story is a realistic case.	1	2	3	4	5
2. I enjoyed working through the story.	1	2	3	4	5
3. The construction activities described in this story are realistic.	1	2	3	4	5
4. The economic information provided in the story is realistic.	1	2	3	4	5
5. The written directions were easy to follow.	1	2	3	4	5
6. The instructions were easy to follow.	1	2	3	4	5
7. The reading level of the story was too difficult.	1	2	3	4	5
8. The story took too long to complete.	1	2	3	4	5
9. The story taught me new information about the relationship between injury and economics.	1	2	3	4	5
10. Prior to working through this story, I hadn't thought much about the implications of injury for my company/the company I work for.	1	2	3	4	5
11. Working through the story will help me size up hazards on the job.	1	2	3	4	5
12. Working the story will help me take action to reduce hazards on the job.	1	2	3	4	5

	Definitely No				Definitely Yes
	1	2	3	4	5
13. Working the story will help me make better judgments about safety when there is pressure to get a job done.	1	2	3	4	5
14. What I learned in the story will help me to prevent injuries on the work site.	1	2	3	4	5
15. The questions and answers were well written.	1	2	3	4	5
16. The story helps me understand the tradeoffs between my own risk of injury and pressure to complete the job.	1	2	3	4	5
17. The story helps me understand the tradeoffs between the risk of injury to coworkers/employees and pressure to complete the job.	1	2	3	4	5
18. The story will help me create a safer work environment in my company/the company I work for.	1	2	3	4	5
19. Working through the story helps me to understand the impact of injury on productivity.	1	2	3	4	5
20. Working through this story helps me to understand my boss' / employees' perspective.	1	2	3	4	5

Master Answer Sheet for the Bob's Builders Exercise

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose as many as you think are correct.)

1. [Although the pressure is on and the broken blocks are costing Bob]
   [money, an injury will cost Bob more money in the long run. Plus]
   [yelling at Fred may cost Bob another worker.]

2. [Correct. Telling Fred to slow down and clean up is important, but]
   [explaining why it is important may be more effective than just telling]
   [him.]

3. [Correct. Bob has identified an injury risk and expressed concern for]
   [Fred as a co-worker. Using personal experiences can drive home]
   [safety messages.]

4. [Both Bob and Fred have their reasons for wanting to get this job]
   [done, but rushing wastes materials and increases the chance of an]
   [injury. If Fred gets hurt, he may not be able to go fishing.]

Question B (Choose only one unless directed to "Try again")

5. [That could be an expensive lesson for both Fred and Bob. Bob is]
   [assuming Fred knows the correct way to throw block. Try again.]

6. [Back injuries affect construction workers of all ages. Construction]
   [workers tend to have over-developed arms and shoulder muscles]
   [and under-developed abdomen and back muscles. This means back]
   [injuries can happen even to a strong young worker. Try again.]

7. [Correct. Although this will take about five minutes, it could prevent a]
   [painful injury for Fred who is Bob's only help right now. Bob can't]
   [afford to lose him.]

8. [Pacing work does help prevent back injuries but only if proper lifting]
[technique is used. Try again.]

9. [Bob already tried a verbal reminder, but Fred is still lifting]
[improperly. There is no reason to believe that a second reminder will]
[be any more effective. Try again.]

Question C (Choose as many as you think are correct.)

10. [Correct. Some back injuries do not show up on x-rays or other]
[medical tests. Therefore, others may doubt that the injury is real.]

11. [Correct. Workers' compensation payments can't begin until]
[someone has been off work for 7 working days, and even then only]
[covers 2/3 of average weekly wages. In addition, he will have to pay]
[for any medications and get reimbursed later.]

12. [Correct. In a recent study of work-related back injuries, 7% resulted]
[in the kinds of chronic disability or disk injury that might prevent]
[heavy work in the future.]

13. [Coverage cannot be denied simply for submitting a legitimate claim.]
[ ]

14. [Correct. Block laying is heavy work, and Bob's company is so small,]
[there may not be any light duty to offer Fred.]

15. [Correct. Nearly 20% of workers with an occupational back injury]
[relapse and lose additional time within six months of the initial return]
[to work. The risk of relapse or re-injury is 3 times greater than the]
[risk of a back injury for someone who has never had one.]

16. [This is not likely if the pain medication is prescribed and taken under]
[proper medical supervision.]

Question D (Choose as many as you think are correct.)

17. [Correct. Word of mouth about quality and reliability can make or break a small construction outfit.]

18. [Correct. He's already lost this contract. If he doesn't get some decent help quickly, he may lose his business and the independence that he worked so hard to get.]

19. [Although it is possible that his rates may go up, it is not certain that they will. Premiums are determined by the number of claims and their size.]

20. [Correct. If Bob is lucky, he will find good help quickly allowing him to meet deadlines safely. But good help is very hard to find.]

Question E (Choose as many as you think are correct.)

21. [Correct. Safety is as much the worker's responsibility as it is the boss's. Workers need to let the boss know when they're not sure how to do things the right way.]

22. [Correct. Less experienced workers may fear for their job if they admit they don't know how to do something. Bob's experience makes him an ideal coach and teacher.]

23. [Back belts alone may not prevent an injury, especially if improper lifting techniques are used. In some cases, back belts may even lead to a false sense of security about how much weight workers can lift safely.]

24. [Correct. Safety reminders from peers that are based on personal experience can be very effective.]

25. [Correct. Loyal workers aim to please. If the only message they get is to hurry at all costs, injuries are more likely, and quality will suffer.]

26. [Correct. They might have been able to make some alternate arrangements for getting the job done, or bought Bob a little time to hire and train some extra help.]

ROGERS' REMODELING EXERCISE

Problem Booklet

Simulation #2

Pamela Kidd
Tim Struttmann
Jonathan Mays
Mark Parshall

Occupational Injury Prevention Program
Kentucky Injury Prevention and Research Center
Kentucky Cabinet for Health Services, Department for Public Health
and University of Kentucky, Chandler Medical Center
Lexington, Kentucky[1]

December, 1997

[1] This latent-image exercise was developed under United States Department of Health & Human Services / United States Public Health Service / Centers for Disease Control & Prevention / National Institue of Occupational Safety and Health (NIOSH) Grant #5 RO1 CCR413067-02 to the Occupational Injury Prevention Program of the Kentucky Injury Prevention & Research Center, Pamela Kidd, Principal Investigator. The views and conclusions contained in this document are those of the authors and do not necessarily represent the official policies or recommendations of NIOSH, the University of Kentucky or any department or agency of the government of the United States or the Commonwealth of Kentucky.

Background
Joe is a carpenter working for Rogers' Remodeling. He has two years experience. The company owner, Mike Rogers has recently sent Joe out on jobs alone. Mike has confidence in Joe's craftmanship. Mike assigned Joe to a job of remodeling and expanding a kitchen. Joe is to remove old cabinets, build soffits, and install new cabinets.

You are an experienced carpenter who has been with the company for ten years. You've been assigned to work with Joe later in the day after you finish at another job. Before Joe went out, Mike told him to be careful and do a good job. Mike also told Joe that you would be coming by later in the day to help him hang the cabinets.

Problem
Joe arrives on the job. The kitchen area is a mess. There are pieces of scrap 2x4s lying on the floor. Drywall scraps and concrete from jackhammering are lying around. There are PVC pipes for the new lines on the floor. Joe realizes that it would take at least a couple of hours to clean up this mess.

Question A
What should Joe do in this situtaion?
(Choose as many as you think are correct.)

1. Call the boss to tell him about the clutter, and ask what he should do.

2. Clean it up himself.

3. Don't do anything about the mess, just get started.

4. Just clear his immediate work area.

Joe decides to start the job. He is two hours into the job when you show up. You tell him that you finished your last job early, and now you're here to help. Joe has taken down the old cabinets, and they're on the kitchen floor. You survey the scene and say, "What a mess!" Joe says, "Hey, it was like that when I started! I'm just doing the best I can working around it." Joe starts to take out a heavy cabinet. You see that he is reaching over too far and has poor footing. You say, "Stop, you're gonna hurt your back."

Question B
What should the two of you do first?
(Choose only one unless directed to "Try Again.")

5. Start to take the cabinets out of the kitchen.

6. Call the subs who left the mess to complain about the situation.

7. Work together as a team to get the site cleaned up before hanging the cabinets.

8. You start installing new cabinets while Joe takes the old ones out to the dumpster.

You try to call Mike to let him know the situation, but he's out, so you leave a message. A while later, as the two of you are finishing the clean-up, Mike stops by to see how things are going. He is surprised to see that the new cabinets still aren't up. He asks, "What's the deal? I thought we would finish this one up today." Joe says,"I tried to work around the mess left by the other subs." Then you tell Mike that when you arrived you decided that the mess needed to be cleaned up before going any further.

Question C
What should Mike say in response to what you and Joe have told him?
(Choose as many as you think are correct.)

9. "You're going to have to hurry up and finish this job."

10. "I'm glad you took time to clean up. That saves time in the long run."

11. "I'm glad you called, but I wish you would have let me know sooner; that way I could have sent you some help earlier."

12. "I'm not paying you to clean up after someone else. Let the guys who made this mess clean it up."

13. "Good! When I sent you out today I asked you to be careful, and do good work. That's what I meant. If you take the time to do a job safely you'll also do it better."

14. "By cleaning up, you probably saved us money by not damaging materials."

Mike sticks around to help finish the job. As they are cleaning up afterwards, Mike reminds Joe, "Remember to let me know, when you run into something unexpected on a job, especially if you think something is unsafe."

Question D
What precautions should Mike take to prevent situations like this in the future? (Choose as many as you think are correct.)

15. Discuss the incident with his employees as they gather the next morning to get their job assignments

16. Visit all worksites to check-up on the workers.

17. Pair inexperienced workers with more experienced workers whenever possible.

18. Remind workers that back injuries occur from improper lifting and slipping or tripping.

19. Contact the subs or the general contractor and tell them/ him about the unsafe situation left by their workers.

ROGERS' REMODELING EXERCISE

ANSWER BOOKLET

Mark your answers in this booklet using the special marker.

Answer Sheet for the Rogers' Remodeling Exercise

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose as many as you think are correct.)

1. [ ]
   [ ]
   [ ]

2. [ ]
   [ ]

3. [ ]
   [ ]

4. [ ]
   [ ]
   [ ]

Question B (Choose only one unless directed to "Try Again.")

5. [ ]
   [ ]

6. [ ]
   [ ]

7. [ ]
   [ ]

8. [ ]
   [ ]

[ ]

Question C (Choose as many as you think are correct.)

9. [ ]
   [ ]
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10. [ ]
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11. [ ]
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12. [ ]
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13. [ ]
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14. [ ]
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Question D (Choose as many as you think are correct.)

15. [ ]
    [ ]
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16. [ ]
    [ ]
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17. [ ]
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18. [ ]
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19. [ ]
    [ ]

[ ]

Finding your score for the multiple choice questions A - D

Look at your marked answer sheet. Count the number of "Correct" answers you selected. (All correct answers start with "Correct.")

Number of "Correct" answers = _____ (Line 1)

Count the number of incorrect answers you selected. (All incorrect answers start with something <u>other</u> than "Correct.") Then subtract that number from 8.

8 - _____ = _____ (Line 2)

Add the numbers on Line 1 and Line 2 to get your total score = _____
Highest possible score = 19 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the exercise.
Leave the completed questionnaire attached to this answer booklet.

Evaluation Form: *Rogers' Remodeling*

Think about the story you just finished. Circle the number that best shows how much you agree or disagree with each statement.	Definitely No				Definitely Yes
	1	2	3	4	5
1. This story is a realistic case.	1	2	3	4	5
2. I enjoyed working through the story.	1	2	3	4	5
3. The construction activities described in this story are realistic.	1	2	3	4	5
4. The economic information provided in the story is realistic.	1	2	3	4	5
5. The written directions were easy to follow.	1	2	3	4	5
6. The instructions were easy to follow.	1	2	3	4	5
7. The reading level of the story was too difficult.	1	2	3	4	5
8. The story took too long to complete.	1	2	3	4	5
9. The story taught me new information about the relationship between injury and economics.	1	2	3	4	5
10. Prior to working through this story, I hadn't thought much about the implications of injury for my company/the company I work for.	1	2	3	4	5
11. Working through the story will help me size up hazards on the job.	1	2	3	4	5
12. Working the story will help me take action to reduce hazards on the job.	1	2	3	4	5

	Definitely No				Definitely Yes
	1	2	3	4	5
13. Working the story will help me make better judgments about safety when there is pressure to get a job done.	1	2	3	4	5
14. What I learned in the story will help me to prevent injuries on the work site.	1	2	3	4	5
15. The questions and answers were well written.	1	2	3	4	5
16. The story helps me understand the tradeoffs between my own risk of injury and pressure to complete the job.	1	2	3	4	5
17. The story helps me understand the tradeoffs between the risk of injury to coworkers/employees and pressure to complete the job.	1	2	3	4	5
18. The story will help me create a safer work environment in my company/the company I work for.	1	2	3	4	5
19. Working through the story helps me to understand the impact of injury on productivity.	1	2	3	4	5
20. Working through this story helps me to understand my boss' / employees' perspective.	1	2	3	4	5

Master Answer Sheet for the Rogers' Remodeling Exercise

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose as many as you think are correct.)

1. [Correct. Mike needs to know the situation. He may need to send]
   [extra help or reschedule other work he had planned. He can't help]
   [solve a problem unless he knows about it.]

2. [Correct. Even though it is not his mess, working around all that]
   [clutter will slow Joe down, and increase his chance of injury.]

3. [Joe shouldn't start the job until the job site is picked up. Remember,]
   [he will be adding to the mess by removing old cabinets.]

4. [This may help some, but still leaves clutter that Joe will have a hard]
   [time seeing when he takes down the old cabinets and moves them]
   [out. He may trip or fall and get injured due to the clutter.]

Question B (Choose only one unless directed to "Try Again.")

5. [Moving heavy cabinets around the clutter may cause either of you to]
   [trip, fall, or get a back injury. Try again.]

6. [It is best to let the boss handle calling the subcontractors. He can]
   [make it clear that they have cost him time and money. Try again.]

7. [Correct. It will go faster that way, plus it will be safer to work without]
   [all the clutter.]

8. [If Joe does this alone, he will still be lifting and carrying bulky]
   [objects while stepping over and around obstacles. Try again]

Question C (Choose as many as you think are correct.)

9. [Although work is behind schedule, hurrying can lead to injuries or poor quality work. The best way to finish up is to pace work evenly and do safe, quality work.]

10. [Correct. One back injury from twisting or tripping will cause the company to do more work with fewer people, putting the company further behind.]

11. [Correct. Communication is crucial because it helps a boss to coordinate all the work the company is doing, and make necessary adjustments to keep work safe and on schedule.]

12. [This could make Mike's employees think that being safe is not a priority for the company. It might discourage them from taking the necessary steps to do a job safely in the future.]

13. [Correct. By linking quality and safety, Mike is communicating standards that will protect his workers and his company's reputation.]

14. [Correct. Materials get damaged when you try to work in a cluttered work area.]

Question D (Choose as many as you think are correct.)

15. [Correct. By discussing the situation, workers get recognition for being safe. They also get the message that their boss cares about their safety.]

16. [A boss shouldn't have to check on his workers all the time. He should communicate clearly that they are to call him when unexpected problems or unsafe conditions are found.]

17. [Correct. Less experienced workers benefit greatly from one-to-one coaching by those with more experience. This also makes it easier to judge when the less experienced employee is able and ready to handle more challenging work.]

18. [Correct. Lifting heavy objects is only one cause of back injuries; improper lifting, slipping, and tripping can all injure the back, too.]

19. [Correct. They may not know about the unsafe conditions left by their employees.]

SMITTY'S DRYWALL EXERCISE

Problem Booklet

Simulation #3

Pamela Kidd
Tim Struttmann
Jonathan Mays
Mark Parshall

Occupational Injury Prevention Program
Kentucky Injury Prevention and Research Center
Kentucky Cabinet for Health Services, Department for Public Health
and University of Kentucky, Chandler Medical Center
Lexington, Kentucky[1]

December, 1997

1 This latent-image exercise was developed under United States Department of Health & Human Services / United States Public Health Service / Centers for Disease Control & Prevention / National Institue of Occupational Safety and Health (NIOSH) Grant #5 RO1 CCR413067-02 to the Occupational Injury Prevention Program of the Kentucky Injury Prevention & Research Center, Pamela Kidd, Principal Investigator. The views and conclusions contained in this document are those of the authors and do not necessarily represent the official policies or recommendations of NIOSH, the University of Kentucky or any department or agency of the government of the United States or the Commonwealth of Kentucky.

Background

Smitty's Residential Drywall company has been in business for 12 years and has a reputation for quality work. Smitty runs two crews and does mostly new residential construction, but also some remodel and repair work. The company does not have an official safety program but they've had only a few minor injuries in the last 2 years.

Dave, age 24, has been hanging drywall for four years with Smitty's. He does good work, but does not have much ambition and works solely for his paycheck at the end of the week. He is somewhat bored with his job and sees it as a dead end. He's not really interested in moving up in the company.

Problem

Dave is part of a three man crew. The crew members are tired from working all day at a new construction site in the heat without ventilation. It is now 5:30 PM. Smitty, the owner, asked them to work overtime today on a service call to replace a bedroom ceiling underneath a plumbing leak that was just repaired. He wants it done today because the owners are anxious for their home to get back to normal.

The crew sets up a 12" wide drywall bench. Dave and Tom, another crew member, carry in the 4' by 12' sheets of drywall from the truck. Dave notices a dresser directly under a corner where they will need to hang the drywall. John, the last crew member, jumps up on the bench and starts measuring for the first cut.

Question A

What factors make this job risky? (Choose as many as you think are correct.)

1. Fatigue after a full day of work.

2. Dave's boredom and lack of motivation.

3. Working around obstacles such as furniture.

4. Smitty, the company owner, isn't there to supervise.

5. The crew size is too small.

6. Hanging drywall on the ceiling.

The crew just wants to get the job done and go home. Tom realizes he left his toolbelt, in the truck, and says he needs to get it. Dave says, "While you're at it, could you bring in some more drop cloths and some extra blades?" Tom goes out to the truck to get these supplies. While Tom is still away, John begins to call out the measurements and Dave cuts the drywall. They have a 4' x 11' piece cut and ready to hang. For some reason, Tom is taking more time than they expected, so rather than wait for him to return to help lift this piece of drywall, Dave gets impatient and lifts it by himself.

Dave starts lifting the piece, but he has to twist to avoid hitting the dresser. As he gets the piece above his shoulders, he feels a sudden pain in his lower back and drops the drywall. Dave is taken to the emergency department and is diagnosed with a low-back strain. Dave is told to stay off work for two weeks and then return for light duty only for 4-6 weeks, depending on follow-up examinations.

Question B

What are some of the **short term** effects of this injury for Dave?
(Choose as many as you think are correct.)

7. He may have less take home pay.

8. He could lose his job.

9. He may have a lot of pain.

10. He could become paralyzed.

11. He may have to pay out-of-pocket for some medical expenses.

At Dave's follow-up examination 4 weeks after the injury, further tests were ordered because his back still hurts. Following an MRI (magnetic resonance imaging) he was diagnosed with a slipped disc. Dave will need to spend at least an additional 4 weeks off work, after which time he will be re-evaluated.

Question C

What are some of the possible **long term** effects of this injury to Dave?
(Choose as many as you think are correct.)

12. He may not be able to do work that requires long periods of standing or lifting.

13. He may need surgery.

14. If he ever decides to look for another job, owners may view him as a risk for another workers' compensation claim.

15. He may end up with chronic pain in his back.

16. The additional four weeks off work **won't** be covered by workers' compensation.

17. His finances may suffer.

18. He may be unable to do things he enjoys, such as fishing or other sports.

19. Assuming he can return to work, he will face larger payroll deductions for Social Security and Medicare.

Question D

What are some of the possible ways this injury could have been avoided? (Choose as many as you think are correct.)

20. Dave could have waited for Tom to return.

21. John could have warned Dave about lifting the drywall by himself.

22. Smitty could have scheduled the job so that it would not be overtime at the end of a long, hard day.

23. Smitty could require all his workers to wear back support belts.

Question E

What are some things that Smitty's company could do to prevent similar injuries from occurring in the future? (Choose as many as you think are correct.)

24. Implement an ongoing company safety program.

25. Encourage workers to do regular exercises that help reduce the risk of back injury.

26. Stop carrying workers' compensation so that workers will have to pay for their own injuries.

SMITTY'S DRYWALL EXERCISE

ANSWER BOOKLET

Mark your answers in this booklet using the special marker.

Answer Sheet for the Smitty's Drywall Exercise

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose as many as you think are correct.)

1. [ ]
   [ ]

2. [ ]
   [ ]

3. [ ]
   [ ]

4. [ ]
   [ ]

5. [ ]

6. [ ]
   [ ]

Question B (Choose as many as you think are correct.)

7. [ ]
   [ ]

8. [ ]
   [ ]

9. [ ]
   [ ]

10. [ ]
    [ ]

11. [ ]
    [ ]

[ ]

Question C (Choose as many as you think are correct.)

12. [ ]
[ ]

13. [ ]
[ ]

14. [ ]
[ ]

15. [ ]
[ ]

16. [ ]
[ ]

17. [ ]
[ ]
[ ]
[ ]

18. [ ]
[ ]

19. [ ]
[ ]

Question D (Choose as many as you think are correct.)

20. [ ]
[ ]

21. [ ]
[ ]
[ ]

22. [ ]
[ ]
[ ]

23. [ ]
[ ]
[ ]

[ ]

Question E (Choose as many as you think are correct.)

24. [ ]
[ ]
[ ]

25. [ ]
[ ]
[ ]
[ ]

26. [ ]

Finding your score for the multiple choice questions A - E

Count the number of correct answers you selected (all that begin with the word "Correct.")

Number "Correct" = _____ (Line 1)

Count the number of incorrect answers you selected. (Incorrect answers begin with some word other than "Correct.")

Subtract number Incorrect from 8. 8 - _____ = _____ (Line 2)

Add the numbers on Line 1 and Line 2 to get your total score = _____ (Line 3)
Highest possible score = 26 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the exercise.
Leave the completed questionnaire attached to this answer booklet.

[ ]

Evaluation Form: *Smitty's Drywall*

Think about the story you just finished. Circle the number that best shows how much you agree or disagree with each statement.	Definitely No 1	2	3	4	Definitely Yes 5
1. This story is a realistic case.	1	2	3	4	5
2. I enjoyed working through the story.	1	2	3	4	5
3. The construction activities described in this story are realistic.	1	2	3	4	5
4. The economic information provided in the story is realistic.	1	2	3	4	5
5. The written directions were easy to follow.	1	2	3	4	5
6. The instructions were easy to follow.	1	2	3	4	5
7. The reading level of the story was too difficult.	1	2	3	4	5
8. The story took too long to complete.	1	2	3	4	5
9. The story taught me new information about the relationship between injury and economics.	1	2	3	4	5
10. Prior to working through this story, I hadn't thought much about the implications of injury for my company/the company I work for.	1	2	3	4	5
11. Working through the story will help me size up hazards on the job.	1	2	3	4	5
12. Working the story will help me take action to reduce hazards on the job.	1	2	3	4	5

	Definitely No				Definitely Yes
	1	2	3	4	5
13. Working the story will help me make better judgments about safety when there is pressure to get a job done.	1	2	3	4	5
14. What I learned in the story will help me to prevent injuries on the work site.	1	2	3	4	5
15. The questions and answers were well written.	1	2	3	4	5
16. The story helps me understand the tradeoffs between my own risk of injury and pressure to complete the job.	1	2	3	4	5
17. The story helps me understand the tradeoffs between the risk of injury to coworkers/employees and pressure to complete the job.	1	2	3	4	5
18. The story will help me create a safer work environment in my company/the company I work for.	1	2	3	4	5
19. Working through the story helps me to understand the impact of injury on productivity.	1	2	3	4	5
20. Working through this story helps me to understand my boss' / employees' perspective.	1	2	3	4	5

Master Answer Sheet for the Smitty's Drywall Exercise

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose as many as you think are correct.)

1. [Correct. Fatigue affects not only physical strength but also affects judgment. Poor judgment contributes to injury and low quality work.]

2. [Correct. Unmotivated workers are more likely to get injured because they are less focused on their work.]

3. [Correct. Obstacles are trip hazards and make you work in awkward positions which cause more strain on your back and shoulders.]

4. [With two crews, it isn't practical for the owner to be at every job. He should expect his employees to do the job safely.]

5. [A three person crew is enough to do this job safely.]

6. [Correct. This involves working off the ground and over your head which could lead to a fall or muscle strain.]

Question B (Choose as many as you think are correct.)

7. [Correct — Workers' compensation only pays two-thirds of the worker's average weekly wage.]

8. [It is illegal to fire someone for submitting an injury claim unless it is fraudulent.]

9. [Correct. Acute pain is common with a back injury. Back pain can keep people from doing things they enjoy or need to do.]

10. [A low back injury rarely causes paralysis if the patient follows the medical treatment plan.]

11. [Correct. For example, an injured worker has to pay up front for medications and then get reimbursed.]

Question C (Choose as many as you think are correct.)

12. [Correct. The kind of work he is used to may be too strenuous. He may have difficulty finding steady work that is less strenuous.]

13. [Correct. A slipped disc may cause chronic pain and muscle weakness. Sometimes surgical removal of the disc is necessary.]

14. [Correct. If he leaves his present job, other owners may not want to risk hiring him for fear of another injury or claim.]

15. [Correct. His back may never heal completely and many injuries to the back result in long-term chronic pain.]

16. [Workers' compensation will cover lost wages as long as medical evaluations indicate that he is unable to return to work.]

17. [Correct. Once he returns to work, he may make less money because of decreased ability to work on the side or put in overtime. In addition, if he is unable to continue doing drywall work, he may not be able to get another job that pays as well.]

18. [Correct. Chronic pain often keeps people from being able to do the things they enjoy.]

19. [Workers' compensation claims have no effect on an individual's payroll deductions for Social Security or Medicare.]

Question D (Choose as many as you think are correct.)

20. [Correct. Having two people lifting a piece this bulky (4' x 11'), when there were obstacles around, may have prevented the injury.]

21. [Correct. Sometimes workers are reluctant to speak up when they see a co-worker doing something unsafely, but verbal reminders from coworkers may prevent a serious injury.]

22. [Correct. The workload should be scheduled so that it can be completed safely in a given time. This job was being started at the end of a long day's work in the heat.]

23. [This injury occurred because of fatigue, impatience, and trying to lift a bulky piece alone when there were obstacles in the way. Back belts are no substitute for judgment about what one can do safely.]

Question E (Choose as many as you think are correct.)

24. [Correct – Safety programs let the workers know that safety is a priority and can provide them with the skills and knowledge they need to work in a safer manner.]

25. [Correct. Construction workers typically have strong arms and legs, but often have weaker abdominal, buttock and back muscles. Regular exercise to strengthen these muscles can help prevent back injuries.]

26. [This is illegal.]

Finding your score for the multiple choice questions A - E

Count the number of correct answers you selected (all that begin with the word "Correct.")

Number "Correct" = _____ (Line 1)

Count the number of incorrect answers you selected. (Incorrect answers begin with some word other than "Correct.")

Subtract number Incorrect from 8. 8 - _____ = _____ (Line 2)

Add the numbers on Line 1 and Line 2 to get your total score = _____ (Line 3)
Highest possible score = 26 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the exercise.
Leave the completed questionnaire attached to this answer booklet.

Appendix D. Year 3 Fall Simulations

Fact Sheet

Instructions Page

Problem Booklet, Answer Booklet and Master Answer Sheet for:

- **Up on the Roof**
- **The Deck Dilemma**
- **Off to a Late Start**

CONSTRUCTION INDUSTRY INJURY and FATALITY FACTS

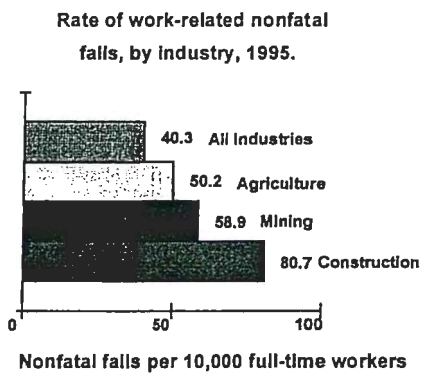
Facts about the construction industry in Kentucky:

In 1996:

- The construction industry employed about 5% of the labor force in Kentucky, but accounted for 14.2% of work-related deaths.
- In Kentucky, construction had a higher number of injuries per 100 full-time workers (8.9) than either mining (7.4) or agriculture (6.7).
- More than half (58.1%) of the construction related injuries in Kentucky happened to workers 25 to 44 years of age.
- The rate of construction-related deaths per 100,000 workers in Kentucky (26) was almost twice the national average (13.9).

Facts about the construction industry Nationally:

- The rate of fall deaths per 100,000 workers in the construction industry (4.5) is more than twice that for both mining (1.6) and agriculture (2.1) industries, based on 1996 statistics.
- In 1995, **Falls** accounted for 30.8% of all work-related deaths in the construction, making falls the leading cause of work-related death in construction.
- In 1995, **construction** had the highest rate of work-related nonfatal injuries due to **falls** of all industries in the US.



Facts about the cost of construction injuries:

- In Kentucky approximately **$20 million** (over $50 thousand a day) is paid out by the workers' compensation program for injuries in the construction industry alone.
- Workers' Compensation covers only 2/3 of an injured worker's average wage. In addition, benefits start only after missing 7 days of work due to a work-related injury or illness. Approximately **62.3%** of construction related injuries in Kentucky during 1996 **did not** qualify for wage compensation.

These figures point to the economic impact of construction injuries. In this safety program, we hope to illustrate the impact of construction injuries on the economic survival of the small construction company and the well-being of the injured worker.

The Story-Based Safety Program

Congratulations! You are participating in a company safety program in the comfort of your own home. The program consists of a series of stories based on real-life situations described by construction workers in a variety of trades. You will get the most out of each story if you read them and answer the questions at home in a place where you won't be disturbed. You have one week to complete all the materials and mail them back to us. By completing each story and answering the questions, your company will receive a discount from Kentucky Employers' Mutual Insurance Company on its workers' compensation premiums. It is our hope that because you participated in this safety program, you will apply the lessons in the stories to your work and will perform your job more safely.

We would like to add that the type of work being performed in each story is not the main issue. Even if you don't do the type of work done in the story the safety issues discussed can still be applied to almost any type of construction work. Therefore, we ask that you complete all of the stories regardless of the type of work you do.

Complete the following six steps to participate in the program:

STEP 1: There are two copies of a form titled "Consent to Participate in a Research Study." Read one of them carefully. If you understand it and agree to participate in the program, sign both forms on the line of the last page that says "Signature of Research Subject." Keep one copy for yourself and return the other signed copy to us with your answer sheets. We must have a signed copy of this form to include your answers in the program.

STEP 2: Complete the green survey form.

STEP 3: Work through the 3 stories by reading the problem booklet (yellow cover) and using the answer sheet (blue cover). To answer the questions in the problem booklet (yellow cover), look for the matching number on the answer sheet (blue cover). There are no words on the answer sheet, but there will be once you move your special marker pen between the brackets. Simply move your marker pen between the brackets for the number you want to choose and the text will appear. Be sure to highlight only the answers you choose and don't try to change your answers. Some questions ask you to choose as many as you think are correct and others ask you to pick the best answer, so read each question carefully. If words do not appear on the answer sheet once you have marked the areas between the brackets with your special marker pen, you can call 1-800-204-3223 and we will send you a new answer sheet.

STEP 4: Complete the pink survey.

STEP 5: Write your name, address, and phone number on the postcard. We need this in order to send you an answer sheet and a follow-up survey.

STEP 6: Use the addressed stamped envelope in the packet to return your signed "Consent to Participate in a Research Study" form, 3 answer sheets (blue covers), the green survey, the pink survey, the postcard, and the special marker pen to our office. Be sure to keep the story booklets (yellow covers) and a "Consent to Participate in a Research Study" form. We will send you a sheet with all the answers in the mail once we receive your packet.

This is not a test. It is not graded or timed. Work at your own pace. But it is VERY important not to read ahead until you have answered the questions in order for each section.

UP ON THE ROOF

Problem Booklet

Pamela Kidd
Tim Struttmann
Jonathan Mays
Mark Parshall
Susan Wojcik

Occupational Injury Prevention Program
Kentucky Injury Prevention and Research Center
Kentucky Cabinet for Health Services, Department for Public Health
and University of Kentucky, Chandler Medical Center
Lexington, Kentucky[1]

November 2, 1998

1 This latent-image exercise was developed under United States Department of Health & Human Services / United States Public Health Service / Centers for Disease Control & Prevention / National Institue of Occupational Safety and Health (NIOSH) Grant #5 RO1 CCR413067-02 to the Occupational Injury Prevention Program of the Kentucky Injury Prevention & Research Center, Pamela Kidd, Principal Investigator. The views and conclusions contained in this document are those of the authors and do not necessarily represent the official policies or recommendations of NIOSH, the University of Kentucky or any department or agency of the government of the United States or the Commonwealth of Kentucky.

Purpose

This simulation exercise is a story about a small construction company, Sam's Roofing, how the characters handle a potentially dangerous situation, and what happens as a result. The exercise is based on focus-group interviews with owners and employees of small construction outfits across Kentucky. The exercise also includes information about economics, productivity, health, and injury from the work of University of Kentucky researchers. The purpose of the exercise is to tell the story of Sam's Roofing in a way that lets you experience some of the decisions the characters have to make. We hope the story is meaningful for you. Your comments and criticisms will help us to revise and improve the story so that it can be used with other construction workers

Instructions

Read the background information and problem situation described on the next three pages. Next, answer each of the questions one at a time. Some questions ask you to select all of the answers that you think are correct. Other questions ask you to choose only one answer unless you are told to "Try again!" Follow the directions for each question. In your answer booklet, use the special marker to mark only the answers you think are correct. Don't jump ahead. As you work through the story, look at the background information (page 3) as often as you need to. It's okay to look back to earlier questions and answers, but please don't change your answers.

After you have selected a choice to a question, look up its number on the answer sheet. The answers are printed in invisible ink. For each answer that you think is correct, mark between all of the brackets for that answer with the special marker pen. A hidden message will appear and tell you if you are right. The object is to select good answers and avoid wrong answers. Do not mark any answers that you think are wrong. When you have finished, you will learn how to score your performance. When you return your completed answer booklets, we will sent you a master answer sheet with all the answers so that you can examine the feedback for incorrect as well as correct answers.

The Company & the Crew:
Sam's Roofing Company has had a busy season. They've kept 2 crews busy all summer with work in several new residential developments. Sam has worked hard over the years to build his company's reputation for quality work and prompt service. The company has a good safety record.

Joe, the foreman of one of the crews, has worked for the company 22 years. Sue is 23; she has worked for the company for two years, and is a reliable worker. She learns quickly, listens well, and has shown that she can do virtually all aspects of the job safely and well. Jerry was hired about four weeks ago at the beginning of his summer break from college. He has no prior experience in roofing, but is eager to learn and works hard.

Problem
It has been raining the past four days so Joe's crew is behind schedule. They were supposed to start a new roof this morning, but got called out for a service call on a home Sam's company roofed last year. There was some leakage around a dormer during the recent storm that is still under warranty. Sam decided that Joe's crew should handle the service call before starting on the new roof because it is on the way to their new job but out of the way for the other crew. In addition, it's supposed to rain again by evening.

When the crew gets to the house for the service call, they see that the house is a 2-story colonial with a steep pitched (12"-in-12") roof, which is slightly damp. The roof probably just needs to be caulked around some flashing, which shouldn't take very long.

Question A
What are some of the potential hazards in this situation?
(Select as many as you think are correct.)

1. The roof is wet.

2. The house is a two-story structure.

3. The roof is steep.

4. There are not enough crew members to do the job safely.

Joe realizes that using fall protection equipment would make the job safer. However, they left their fall protection gear back at the warehouse because they figured they wouldn't need it for the new roof they will be starting on — a one-story ranch with a shallow-pitched (4" in 12") roof.

The service call is only going to take an hour or two at most. Going back to get the fall protection gear will take about 45 minutes (round-trip) if traffic is light. In addition to their extension ladder, they have a 100ft length of quarter-inch nylon rope and a chicken ladder (with hooks on the top) with them on the truck.

See Figure 1 on the next page for an illustration of the fall protection gear and roof pitch.

Question B

What should Joe do now?
(Choose only one answer unless told to try again.)

5. Talk to Jerry & Sue about the importance of getting this job done as quickly as possible.

6. Talk to Jerry & Sue about whether they should go ahead and start the job anyway.

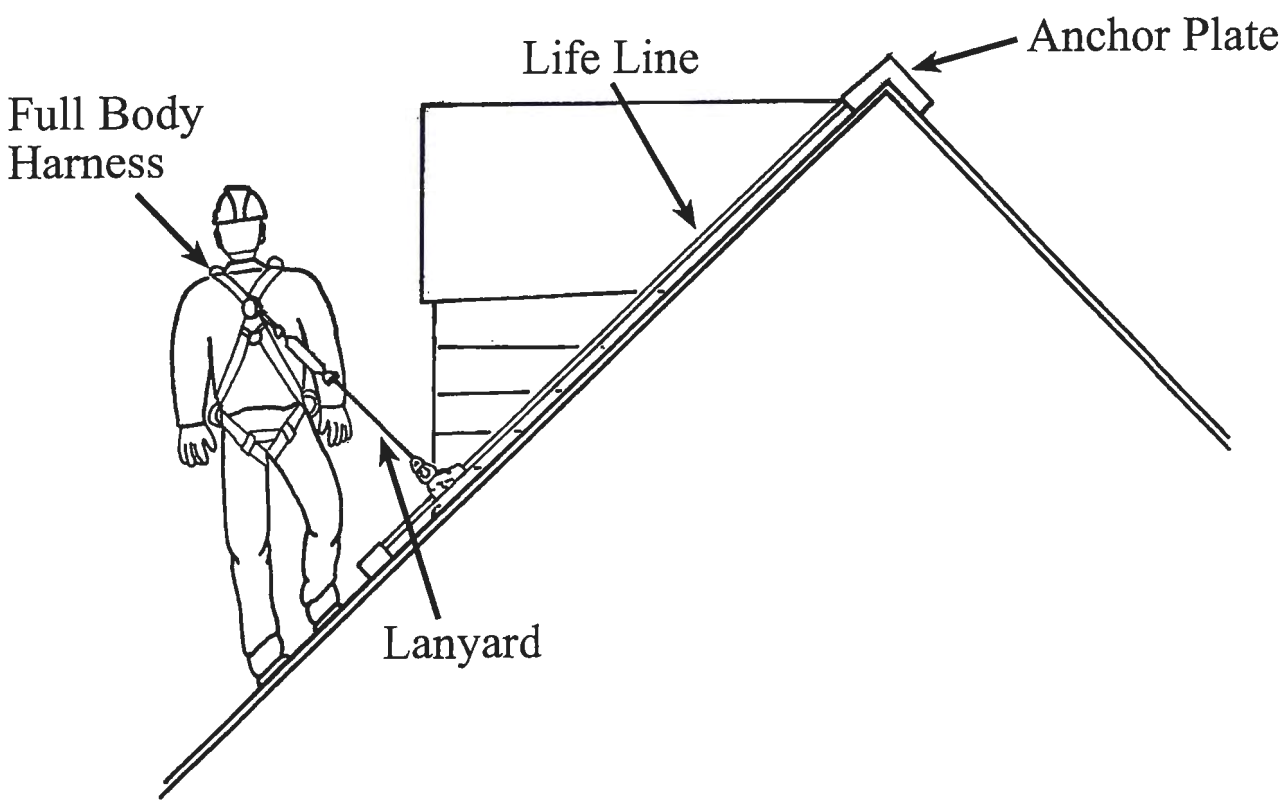
7. Show Jerry and Sue how to rig something up using the nylon rope because it's such a quick job.

8. Leave to go to the next job, and come back tomorrow with the fall protection gear.

9. Go back and get the fall protection equipment.

10. Hang the chicken ladder from the peak of the roof so that it's laying alongside the dormer, and work off of it.

Figure 1: Illustration of a 12" in 12" pitch roof and fall protection gear.



Joe, Jerry, & Sue return to the warehouse to get the fall protection gear: lifelines, lanyards, harnesses, and anchor plates. They take the gear with them and return to the house to do the repairs.

Question C

Who is the best person to go up on the roof?
(Choose only one unless told to try again).

11. Sue

12. Joe

13. Jerry

Normally Joe would go up on the roof, however he is feeling under the weather and a little unsteady this morning, so he decides to have Sue go up. He explains to both Sue and Jerry how he thinks they should organize things so the job can be done safely and efficiently.

They set the extension ladder so that the top extends three feet above the gutters. Sue puts on the harness and her tool belt and goes up. She takes one end of the rope with her to use for hauling the rest of the gear up. Jerry comes part way up the ladder and passes the chicken ladder up to Sue. She slides it up along the roof until the hooks are secured over the peak. She then uses the rope to haul up a bucket with the lifeline, lanyard, anchor plates and the caulking gun in it. Sue uses the chicken ladder to get to the peak of the roof, then sets the anchor plate, and fastens the lifeline and lanyard. Once the fall protection gear is secured in the way the manufacturer recommends, Sue goes to the dormer, identifies the likely source of the leak, and seals it. She inspects the roof four other possible leaks, then goes back up to the top of the roof, removes the anchor plate, lifeline and lanyard, patches the holes left by the anchor plate, and comes down off the roof.

Question D

In doing this job, what were the major hazards that Sue faced?
(Select as many as you think are correct.)

14. Going up to the peak of the roof without any fall protection to set the anchor plate.

15. Multiple trips up and down the ladder.

16. Tripping on the lifeline or lanyard.

17. An injury from the harness if she fell.

18. After finishing the job, coming down from the peak of the roof without fall protection.

By this time, they are about 2 hours behind schedule because of travel time, and the additional time needed to do the service job using fall protection. When they arrive at the new job, Sam is waiting for them, and asks what took so much time. He says that he got a call from the general contractor wanting to know why they were late. He also says that its almost certainly going to rain again later this afternoon. Joe tells Sam that the job was too risky to do without fall protection and they had to go back to get it.

Question E

How should Sam respond? (Select as many as you think are correct.)

19. He tells Joe that he did the right thing so no one would get hurt.

20. He says he will dock Joe for the extra travel time.

21. He says he will change company policy to clarify that fall protection gear should be available on every job site.

22. He says he will look into purchasing or leasing equipment for better communication with crews.

UP ON THE ROOF

ANSWER BOOKLET

Mark your answer in this booklet using the special marker pen.

Answer Sheet for Up On The Roof

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special marker pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Select as many as you think are correct.)

1. [ ]
   [ ]

2. [ ]
   [ ]

3. [ ]
   [ ]

4. [ ]
   [ ]

Question B (Choose only one unless told to try again.)

5. [ ]
   [ ]

6. [ ]
   [ ]
   [ ]

7. [ ]
   [ ]
   [ ]

8. [ ]
   [ ]
   [ ]

9. [ ]
   [ ]

10. [ ]
    [ ]

[ ]

Question C (Choose only one unless told to try again.)

11. [ ]
    [ ]

12. [ ]
    [ ]

13. [ ]
    [ ]

Question D (Select as many as you think are correct.)

14. [ ]
    [ ]
    [ ]
    [ ]

15. [ ]
    [ ]

16. [ ]
    [ ]

17. [ ]
    [ ]
    [ ]

18. [ ]
    [ ]

Question E (Select as many as you think are correct.)

19. [ ]

20. [ ]
    [ ]

21. [ ]

22. [ ]
    [ ]
    [ ]

[ ]

Finding your score for the multiple choice questions A - E

Count the number of correct answers you selected (All answers that begin with the word "Correct.")

Number "Correct" = _____ (Line 1)

Count the number of incorrect answers you selected and subtract that number from 12. (All incorrect answers begin with something other than "Correct.")

12 - _____ = _____ (Line 2)

Add the numbers in Lines (1) and (2) to get your total score = _____ (Line 3)
Highest possible score = 22 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the story.
Leave the completed questionnaire attached to this answer booklet.

Evaluation Form: Up On The Roof

Date ___-___-___

Think about the story you just finished. Circle the number that best shows how much you agree or disagree with each statement.	Definitely No 1	2	3	4	Definitely Yes 5
1. This story is a realistic case.	1	2	3	4	5
2. I enjoyed working through the story.	1	2	3	4	5
3. The construction activities described in this story are realistic.	1	2	3	4	5
4. The people in this story are like people I have worked with.	1	2	3	4	5
5. The economic information provided in the story is realistic.	1	2	3	4	5
6. The instructions were easy to follow.	1	2	3	4	5
7. The story took too long to complete.	1	2	3	4	5
8. The story taught me new ways of thinking about the relationship between injury and economics.	1	2	3	4	5
9. Working through the story will help me size up hazards on the job.	1	2	3	4	5
10. Working through the story will help me take action to reduce hazards on the job.	1	2	3	4	5
11. Working through the story will help me make better judgments about safety when there is pressure to get a job done.	1	2	3	4	5
12. What I learned in the story will help me to prevent injuries on the work site.	1	2	3	4	5

	Definitely No				Definitely Yes
	1	2	3	4	5
13. The questions and answers were well written.	1	2	3	4	5
14. The story helps me understand the tradeoffs between my own risk of injury and pressure to complete the job.	1	2	3	4	5
15. The story helps me understand the tradeoffs between the risk of injury to coworkers/ employees and pressure to complete the job.	1	2	3	4	5
16. The story will help me create a safer work environment in our company.	1	2	3	4	5
17. Working through the story helps me to understand the impact of injury on productivity.	1	2	3	4	5
18. Working through this story helps me to understand my boss' / employees' perspective.	1	2	3	4	5
19. The picture was easy to understand.	1	2	3	4	5
20. Planning out a job before getting started makes things safer all around.	1	2	3	4	5

Master Answer Sheet for Up On The Roof

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special marker pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Select as many as you think are correct.)

1. [Correct. It's been raining and the roof is still damp, so traction is likely to be poor.]

2. [Correct. It's possible to get hurt badly from a fall of little as 6 feet. Falls from greater heights are likely to cause more serious injury.]

3. [Correct. A 12"-in-12" pitch is a 45° angle; it's easy to lose your footing on a roof this steep even when it is dry.]

4. [This is probably not a problem. This job does not require three people, but the next job will.]

Question B (Choose only one unless told to try again.)

5. [This won't improve the situation; it just puts pressure on everyone. Try again.]

6. [Joe is the foreman and most experienced person on the job. He has already determined that fall protection is needed. He should make the call. Try again.]

7. [This is not a good idea. A rigged up system can't offer the same level of protection as equipment specifically designed for fall protection. Try again.]

8. [From a safety standpoint this would be a good option, but might anger the customer if it rains again before the repair. Further rain damage could be costly to the company. Try again.]

9. [Correct. This is the best option given the risks of the job and the fact that more rain is predicted by evening.]

10. [The chicken ladder makes it easier to get to the top of the roof, but is no substitute for proper fall protection gear. Try again.]

Question C (Choose only on unless told to try again.)

11. [Although Sue is reasonably experienced, she is not the best choice.]
    [Try again.]

12. [Correct. Joe is the most experienced by far, and therefore, the best]
    [person to do the job.]

13. [This would not be a wise choice. Jerry has only been with the]
    [company a few weeks and has hardly any experience. Try again.]

Question D (Select as many as you think are correct.)

14. [Correct. Even with the chicken ladder, this was an initial risk for a]
    [few minutes. However, taking the time to set up the fall protection]
    [gear properly made the rest of the job, including searching the entire]
    [roof for other leaks much safer.]

15. [By planning out the job carefully Joe was able to keep the number of]
    [trips up and down to a minimum.]

16. [Due to the pitch of the roof, it is unlikely that she would trip on the]
    [lifeline or lanyard. Even if she did, she would not fall to the ground.]

17. [A harness can cause some injury in a fall, but this is rare. Even]
    [when it does, the injury is hardly ever as serious as what would]
    [happen without fall protection.]

18. [Correct. This was hard to avoid. However, using fall protection]
    [limited the total time she was exposed to a high risk situation.]

Question E (Select as many as you think are correct.)

19. [Correct. The cost of an injury would have been much greater.]

20. [This is not a good idea because it gives the message that getting]
    [the job done on time is valued more than worker safety.]

21. [Correct. This is a good idea. It could prevent delays like today's.]

22. [Correct. Portable communication equipment would allow Sam to]
    [know about problems right away. This could increase both safety]
    [and efficiency.]

THE DECK DILEMMA

Problem Booklet

Pamela Kidd
Tim Struttmann
Jonathan Mays
Mark Parshall
Susan Wojcik

Occupational Injury Prevention Program
Kentucky Injury Prevention and Research Center
Kentucky Cabinet for Health Services, Department for Public Health
and University of Kentucky, Chandler Medical Center
Lexington, Kentucky[1]

November 2, 1998

1 This latent-image exercise was developed under United States Department of Health & Human Services / United States Public Health Service / Centers for Disease Control & Prevention / National Institue of Occupational Safety and Health (NIOSH) Grant #5 RO1 CCR413067-02 to the Occupational Injury Prevention Program of the Kentucky Injury Prevention & Research Center, Pamela Kidd, Principal Investigator. The views and conclusions contained in this document are those of the authors and do not necessarily represent the official policies or recommendations of NIOSH, the University of Kentucky or any department or agency of the government of the United States or the Commonwealth of Kentucky.

Purpose

This simulation exercise is a story about a small construction company, how the characters handle a potentially dangerous situation, and what happens as a result. The exercise is based on focus-group interviews with owners and employees of small construction outfits across Kentucky. The exercise also includes information about economics, productivity, health, and injury from the work of University of Kentucky researchers. The purpose of the exercise is to tell the story in a way that lets you experience some of the decisions that are made when there is pressure to finish the job. We hope the story is meaningful for you. Your comments and criticisms will help us to revise and improve the story so that it can be used with other construction workers

Instructions

Read the background information and problem situation described on the next three pages. Next, answer each of the questions one at a time. Some questions ask you to select all of the answers that you think are correct. Other questions ask you to choose only one answer unless you are told to "Try again!" Follow the directions for each question. In your answer booklet, use the special marker pen to mark only the answers you think are correct. Don't jump ahead. As you work the story, look at the background information (page 3) as often as you need to. It's okay to look back to earlier questions and answers, but please don't change your answers.

After you have selected a choice to a question, look up its number on the answer sheet. The answers are printed in invisible ink. For each answer that you think is correct, mark between all of the brackets for that answer with the special marker pen. A hidden message will appear and tell you if you are right. The object is to select good answers and avoid wrong answers. Do not mark any answers that you think are wrong. When you have finished, you will learn how to score your performance. When you return your completed answer booklets we will send you a master answer sheet with all the answers so that you can examine the feedback for incorrect as well as correct answers.

Background
You have just moved to a larger city and want to continue working as a carpenter. Where you came from, work was steady and in your most recent job you worked for the same company for three years. Overall, you have six years experience as a carpenter, so you are able to find a job quickly with a remodeling firm. The company you are working for now is very busy and there has been a lot of overtime work recently. The boss is pretty uptight because the company just got underbid on a job and lost that contract.

You are a craftsman and take a lot of pride in your work. Where you worked before, there was less pressure from competition. The pace you are now working at is faster than you had to deal with before, and you've been working overtime more often and for more hours than you ever did before.

Problem
It is late in the day and the end of a very long work week in March. You are building an elevated deck that is four feet above ground. The posts, bands, and most of the joists are set. The temperature is 36°F. It snowed two days ago and the deck is in the shade. The worksite is slushy and icy. Based on these weather conditions there are plenty of slip hazards at the site. You also feel that where you used to work this would have been a two person job. Another subcontractor is hanging vinyl soffit and he is snipping pieces that are landing near the deck where you will be working. In addition, there are shingle scraps on the ground that were left by a roofing crew earlier in the day. See Figure 1 on the next page for an illustration of the job site.

Question A
Which of the following should you do?
(Choose only one unless directed to "Try again.")

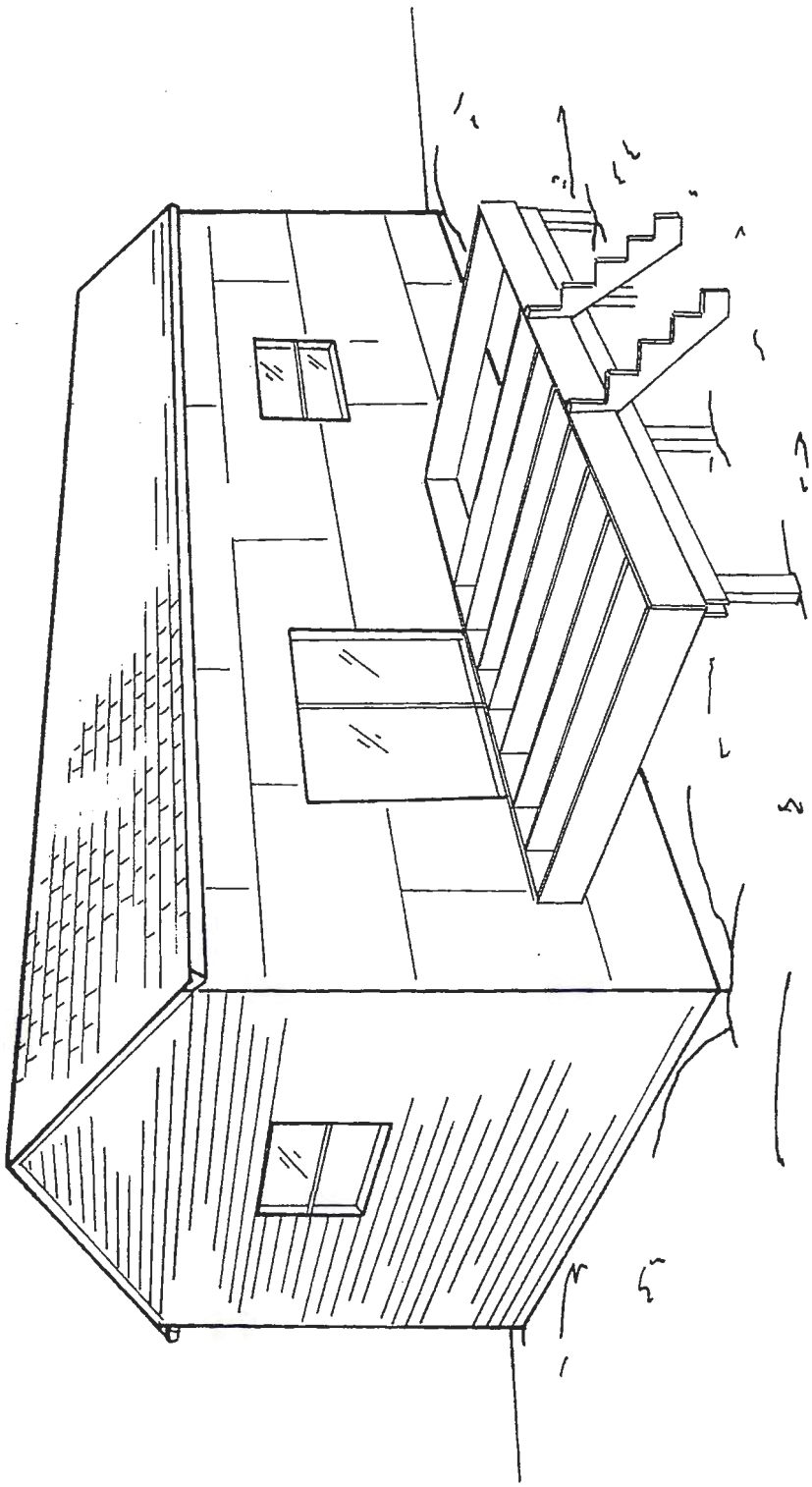
1. Don't worry about the mess, just get started.

2. Clean the mess up by yourself.

3. Tell the siding worker where you will need a clear area, and ask if he would pick up the vinyl scraps while you get rid of the shingles.

4. Throw some 2 x 6 boards on the ground to walk on when you're carrying materials to the deck area.

Figure 1: Illustration of job site.



You and the siding worker clean up the work area. You take some 2 x 6 material and put it on the stair stringers for temporary tread because you don't want to scar up the permanent treads. Normally you would nail these down but you are rushing and want to get the job done. The boss said he was going to stop by the site and you want to show him that you've gotten a lot of work done.

Question B
What factors in this situation contribute to an unsafe worksite?
(Select as many as you think are correct.)

5. Being in a hurry.

6. Not nailing down the temporary treads.

7. Lack of communication with the boss.

8. You don't have any fall protection.

9. Too many overtime hours recently.

10. The boss trusted you to manage the scene.

You are carrying a 2 x 8 piece of lumber that is 12 feet long up to the deck. As you step on the temporary tread, it shifts causing you to slip and fall. Trying to catch your fall, you wind up breaking your right wrist. You are right handed.

Question C
What might happen as a result of this injury to your right wrist?
(Select as many as you think are correct.)

11. You may need 6 to 12 weeks to recover.

12. You might get fired.

13. You may have difficulties returning to your previous job activities.

14. You may need to change your career.

15. You may have financial losses.

16. You may become addicted to pain medication.

17. There may be added stress on your family.

Question D

What are the possible problems this injury may create for the company?
(Select as many as you think are correct.)

18. There may be increased worker's compensation insurance premiums.

19. Productivity may decline.

20. The company may lose it's worker's compensation coverage.

21. The company's reputation may suffer.

Question E

What steps should the company take to improve the climate for safety and prevent this type of injury from happening?
(Select as many as you think are correct.)

22. Develop written safety policies and communicate them clearly.

23. Start a simple safety program consisting of toolbox meetings, reminders and incentives.

24. Consider safety when bidding jobs and planning work.

25. Create and maintain clear communication about safety.

26. Purchase safety equipment.

№ 1743

DECK DILEMMA

ANSWER BOOKLET

Mark your answer in this booklet using the special marker pen.

Answer Sheet for Deck Dilemma

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special marker pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose only one answer unless directed to "Try again.")

1. [ ]
   [ ]

2. [ ]
   [ ]
   [ ]

3. [ ]
   [ ]
   [ ]

4. [ ]
   [ ]

Question B (Select as many as you think are correct.)

5. [ ]
   [ ]

6. [ ]
   [ ]

7. [ ]
   [ ]

8. [ ]
   [ ]

9. [ ]
   [ ]

10. [ ]
    [ ]

[ ]

Question C (Select as many as you think are correct.)

11. [ ]

12. [ ]

13. [ ]
[ ]
[ ]

14. [ ]
[ ]
[ ]

15. [ ]
[ ]
[ ]

16. [ ]
[ ]

17. [ ]
[ ]
[ ]

Question D (Select as many as you think are correct.)

18. [ ]
[ ]

19. [ ]
[ ]

20. [ ]
[ ]

21. [ ]
[ ]

[ ]

Question E (Select as many as you think are correct.)

22. [ ]
    [ ]

23. [ ]
    [ ]
    [ ]

24. [ ]
    [ ]

25. [ ]
    [ ]
    [ ]

26. [ ]
    [ ]
    [ ]

Finding your score for the multiple choice questions A - E

Count the number of answers you selected that begin with the word "Correct"

Number "Correct" = _____ (Line 1)

Count the number of incorrect answers you selected (All incorrect answers begin with something other than "Correct".)
Then subtract that number from 9. 9 - _____ = _____ (Line 2)

Add the numbers in blanks (1) and (2) to get your total score = _____ (Line 3)
Highest possible score = 26 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the story.
Leave the completed questionnaire attached to this answer booklet.

[ ]

Evaluation Form: *Deck Dilemma*

Date ___-___-___

Think about the story you just finished. Circle the number that best shows how much you agree or disagree with each statement.	Definitely No 1	2	3	4	Definitely Yes 5
1. This story is a realistic case.	1	2	3	4	5
2. I enjoyed working through the story.	1	2	3	4	5
3. The construction activities described in this story are realistic.	1	2	3	4	5
4. The people in this story are like people I have worked with.	1	2	3	4	5
5. The economic information provided in the story is realistic.	1	2	3	4	5
6. The instructions were easy to follow.	1	2	3	4	5
7. The story took too long to complete.	1	2	3	4	5
8. The story taught me new ways of thinking about the relationship between injury and economics.	1	2	3	4	5
9. Working through the story will help me size up hazards on the job.	1	2	3	4	5
10. Working through the story will help me take action to reduce hazards on the job.	1	2	3	4	5
11. Working through the story will help me make better judgments about safety when there is pressure to get a job done.	1	2	3	4	5
12. What I learned in the story will help me to prevent injuries on the work site.	1	2	3	4	5

	Definitely No				Definitely Yes
	1	2	3	4	5
13. The questions and answers were well written.	1	2	3	4	5
14. The story helps me understand the tradeoffs between my own risk of injury and pressure to complete the job.	1	2	3	4	5
15. The story helps me understand the tradeoffs between the risk of injury to coworkers/ employees and pressure to complete the job.	1	2	3	4	5
16. The story will help me create a safer work environment in our company.	1	2	3	4	5
17. Working through the story helps me to understand the impact of injury on productivity.	1	2	3	4	5
18. Working through this story helps me to understand my boss' / employees' perspective.	1	2	3	4	5
19. The picture was easy to understand.	1	2	3	4	5
20. Clearing clutter from the work site saves time and trouble later.	1	2	3	4	5

Master Answer Sheet for Deck Dilemma

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special marker pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Choose only one answer unless directed to "Try again.")

1. [Working around a mess takes longer and increases your chances of]
   [getting injured. Try again.]

2. [This is wiser than just starting the job, but it doesn't address the]
   [problem of having to work around workers from other outfits in less]
   [than ideal conditions. Try again.]

3. [Correct. It is best to address the problem directly and work together]
   [to create and maintain a safe worksite for both of you. He says,]
   ["OK, lets do it!", and helps you clean up.]

4. [This creates another trip and slip hazard in the midst of these sloppy]
   [work conditions. Try again.]

Question B (Select as many as you think are correct.)

5. [Correct. Hurrying and rushing often cause mistakes or injuries that]
   [can lead to decreased productivity.]

6. [Correct. It would be safer to nail them down to keep them from]
   [slipping out from under you.]

7. [Correct. The boss may not be aware of how slippery conditions are.]
   [He might be able to send help to make carrying materials safer.]

8. [The deck is only 4 feet above grade. You don't need fall protection]
   [from that height.]

9. [Correct. Too much overtime leads to fatigue which interferes with]
   [work quality and safety.]

10. [Because you are an experienced craftsman, this should not]
    [contribute to an unsafe worksite.]

Question C (Select as many as you think are correct.)

11. [Correct. This is an average recovery time for this type of injury.]

12. [It is not legal to fire an employee for a legitimate work-related injury.]

13. [Correct. If you break the wrist of your dominant hand, even after the]
[fracture heals, there may be limited movement due to pain or]
[arthritis.]

14. [Correct. This is possible depending on how the healing process]
[evolves. If you get arthritis or chronic inflammation in the wrist, you]
[may not be able to continue in this line of work.]

15. [Correct. Worker's compensation only covers 2/3 of average weekly]
[wage, not including overtime. Benefits don't start until an injured]
[worker has been unable to work for seven days.]

16. [This is unlikely. Once the fracture has been set and casted, non-]
[prescription pain medicine is usually enough.]

17. [Correct. Pain makes a person irritable and hard to live with. There]
[may also be stresses from being home more, and from decreased]
[earnings.]

Question D (Select as many as you think are correct.)

18. [Correct. Premiums may be increased depending on the size or]
[frequency of claims.]

19. [Correct. Working with less help or hiring and training new help will]
[be necessary and will temporarily decrease productivity.]

20. [Worker's compensation coverage could not be terminated solely for]
[submitting a claim.]

21. [Correct. They may get a bad rap for not finishing work on time,]
[doing poor quality work, or having frequent injuries.]

Question E (Select as many as you think are correct.)

22. [Correct. This lets employees know the company's expectations and workers' responsibilities.]

23. [Correct. This does not have to be a big deal, but may play a key role in creating and maintaining a safe work climate, lowering injury rates, and saving money.]

24. [Correct. Planning work involves looking at work load, worksite conditions, and the experience level of the work force.]

25. [Correct. Workers must feel comfortable telling the boss about unsafe conditions. They must also feel a responsibility to remind one another about safety.]

26. [Better safety equipment may help in some situations, but not in situations like this, where safety problems were due to rushing, overwork, fatigue, and taking shortcuts. Try again.]

Finding your score for the multiple choice questions A - E

Count the number of answers you selected that begin with the word "Correct"

Number "Correct" = _____ (Line 1)

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OFF TO A LATE START

Problem Booklet

Pamela Kidd
Tim Struttmann
Jonathan Mays
Mark Parshall
Susan Wojcik

Occupational Injury Prevention Program
Kentucky Injury Prevention and Research Center
Kentucky Cabinet for Health Services, Department for Public Health
and University of Kentucky, Chandler Medical Center
Lexington, Kentucky[1]

November 2, 1998

1 This latent-image exercise was developed under United States Department of Health & Human Services / United States Public Health Service / Centers for Disease Control & Prevention / National Institue of Occupational Safety and Health (NIOSH) Grant #5 RO1 CCR413067-02 to the Occupational Injury Prevention Program of the Kentucky Injury Prevention & Research Center, Pamela Kidd, Principal Investigator. The views and conclusions contained in this document are those of the authors and do not necessarily represent the official policies or recommendations of NIOSH, the University of Kentucky or any department or agency of the government of the United States or the Commonwealth of Kentucky.

Purpose

This simulation exercise is a story about a small construction company, Martin's Siding, how the characters handle a potentially dangerous situation, and what happens as a result. The exercise is based on focus-group interviews with owners and employees of small construction outfits across Kentucky. The exercise also includes information about economics, productivity, health, and injury from the work of University of Kentucky researchers. The purpose of the exercise is to tell the story of Martin's Siding in a way that lets you experience some of the decisions that are made when there is pressure to finish the job. We hope the story is meaningful for you. Your comments and criticisms will help us to revise and improve the story so that it can be used with other construction workers.

Instructions

Read the background information and problem situation described on the next three pages. Next, answer each of the questions one at a time. Some questions ask you to select all of the answers that you think are correct. Other questions ask you to choose only one answer unless you are told to "Try again!" Follow the directions for each question. In your answer booklet, use the special marker pen to mark only the answers you think are correct. Don't jump ahead. As you work the exercise, look at the background information on Martin's Siding (page 3) as often as you need to. It's okay to look back to earlier questions and answers, but please don't change your answers.

After you have selected a choice to a question, look up its number on the answer sheet. The answers are printed in invisible ink. For each answer that you think is correct, mark between all of the brackets for that answer with the special marker pen. A hidden message will appear and tell you if you are right. The object is to select good answers and avoid wrong answers. Do not mark any answers that you think are wrong. When you have finished, you will learn how to score your performance. When you return your completed answer booklets we will send you a master answer sheet with all the answers so that you can examine the feedback for incorrect as well as correct answers.

Background

Frank Martin is the owner of Martin's Siding, a residential construction company specializing in vinyl siding. Frank is 38 years old, and has been in business for himself for three years. He has 4 regular employees, two of whom have only been with him for a short time. Business has been good over the past year; he is generally able to keep his crew working full-time. Frank does all of the bidding, but other than that works along with the crew most of the time.

They are starting on a new job today, hanging vinyl siding on an under-construction two story home with full basement. It is 7:30 a.m. on Monday morning. Two of the crew (Gary and Pete) are at the site when Frank arrives. Pete is 25 years old and has been working for Frank for about two months. Gary is 28 and has been working for Frank for a week. Gary and Pete were partners in a landscaping business for 7 years prior to working for Frank.

It rained over the weekend and the site is muddy. The basement wall has been partially backfilled and there are puddles close-by. The site is not level. Dense grade gravel has been poured as a temporary drive. Various piles of equipment and construction debris are scattered about the site.

Frank's pickup has ladder racks carrying four 26-foot nonconductive extension ladders, ladder jacks, and a 16 foot walkboard. The truck also has a portable phone and a two way radio.

Problem

The vinyl siding is due to arrive any minute. Frank has an 8:00 a.m. appointment to bid another job several miles away. Owen, a 23 year old skilled worker who has been with him for all 3 years, calls in on the cellular phone to say that he is late because of having to take care of a sick child. He says he should be there within the hour. Frank still has not heard from the other crew member. He looks at his watch and sees he has 20 minutes to get to the site of the next prospective job. He is short the two workers who would be able to get the job underway without his direct supervision.

Frank has to leave to get to his appointment and expects to be gone about an hour. Meanwhile, he'd like this job to be well under way by the end of the day, so he doesn't want the crew just waiting for him to return or for Owen to show up. He decides to have Pete and Gary set up the ladders, ladder jacks, and walkboards on the side of the house that still needs fascia and soffit work so everything will be set up by the time he gets back. See Figure 1 on the next page for an illustration of this equipment.

Question A

What instructions should Frank give to Pete and Gary?
(Select as many as you think are correct.)

1. "Inspect the ladders for defects like missing cleats, split rails, or broken rungs."

2. "Avoid the electrical power lines, even though the ladders are nonconductive."

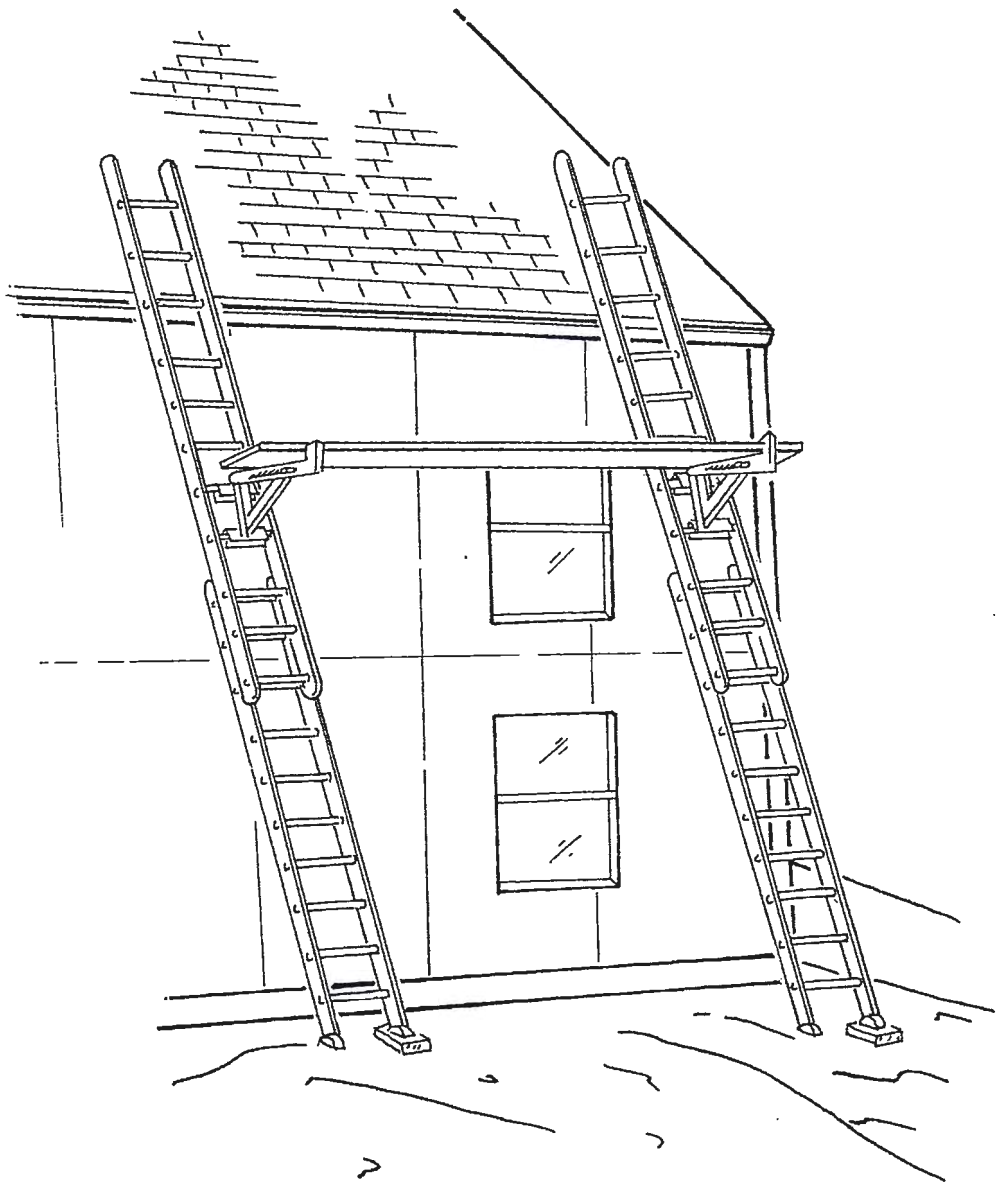
3. "Make sure the ladders are stable and on a level surface."

4. "Set up a third ladder with a ladder jack and use the fourth ladder and a 2" X 8" board to rig up another walkboard to move the job along quicker."

5. "Don't get up on the walkboard until I check it or Owen does."

6. "Get as much done as you can while I'm gone."

Figure 1: Illustration of ladders, ladder jacks, and walkboard.



Frank tells Pete and Gary to set up the ladders, ladder jacks, and walkboard, but to stay off the walkboard and not to begin the job until he returns or Owen arrives and leaves. Owen arrives 30 minutes later. He radios Frank to let him know he's arrived. It is now 9:00 a.m. and the delivery truck has finally arrived. While the siding is being unloaded, Pete and Gary are at Owen's truck on the other side of the house getting the break and saw horses.

Owen notices that the ladders appear to be on an uneven and unstable surface. Owen is the same age as Pete and Gary, and friends with them. Although he is more experienced, he doesn't want to put them down or seem bossy.

Question B

What should Owen do?
(Choose only one unless directed to "Try again.")

7. Straighten the ladders while Pete and Gary are on the other side of the house.

8. Wait to secure and stabilize the ladders until Pete and Gary can see him.

9. Wait until Frank arrives so he can deal with the problem.

10. Call Pete and Gary over and show them how to secure the ladders properly.

While Owen is mulling over what to do, Frank returns. He sees Pete and Gary setting up the break, sawhorses, and saw station. It appears that everything is ready to start the job. Owen apologizes for being late. He says his sick child kept him up most of the night, and he's pretty tired. Owen says he was late because he had to make alternate arrangements for child care this morning. He also tells Frank that the other worker still hasn't shown up. Frank tells him they really need to get the job well under way today. Frank decides that he and Pete will start on the fascia and soffit while Owen and Gary begin hanging siding on the other side of the house at ground level. Pete will work the break and saw and Frank will install from the walkboard.

Frank gets his toolbelt on and starts up the ladder. When he is about 8 feet off the ground the top of the ladder starts sliding and he jumps off. When he hits the ground, his foot hits some debris and his right ankle twists. He drops to the ground immediately because of the pain in his ankle. Owen and the rest of the crew rush over when they hear Frank yell. They take him to the nearest hospital where he is diagnosed with a broken right ankle that is bad enough to require surgery. Two days later, after his surgery, Frank is able to get about on crutches, but he won't be able to drive or bear any weight on the injured ankle for at least six weeks. Unfortunately, Frank had opted out of worker's compensation coverage for himself in order to save money. He doesn't have medical insurance, so he will have to pay the following bills himself.

Emergency room	$1,200
Surgery	$7,500
Physical therapy	$700
Hospital stay	$2,200
Prescriptions	$700
Total	$12,300

Question C

In addition to these costs, what are some potential hidden costs from this injury for Frank and his company?
(Select as many as you think are correct.)

11. He may not be able to bid other jobs for a while.

12. He may need to hire and train another worker.

13. His workers' compensation premium may increase.

14. He may need to change careers if he cannot recover 100% from the injury.

Question D

What are some of the major ways this kind of injury Frank had could be prevented in the future?
(Select as many as you think are correct.)

15. Check all ladders, walkboards, scaffolds, etc. before climbing to make sure they are secure.

16. Train all new employees in safety matters such as how to set up and check ladders and walkboards properly.

17. Hire only experienced workers.

18. Institute a safety program designed for this small company.

OFF TO A LATE START

ANSWER BOOKLET

Mark your answer in this booklet using the special marker pen.

Answer Sheet for Off To A Late Start

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special marker pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Select as many as you think are correct.)

1. [ ]
   [ ]

2. [ ]
   [ ]
   [ ]
   [ ]

3. [ ]
   [ ]

4. [ ]
   [ ]

5. [ ]
   [ ]
   [ ]

6. [ ]
   [ ]

Question B (Choose only one answer unless directed to "Try again.")

7. [ ]
   [ ]

8. [ ]
   [ ]
   [ ]

9. [ ]
   [ ]
   [ ]

10. [ ]
    [ ]

[ ]

Question C (Select as many as you think are correct.)

11. [ ]
    [ ]
    [ ]

12. [ ]
    [ ]
    [ ]

13. [ ]
    [ ]
    [ ]

14. [ ]
    [ ]

Question D (Select as many as you think are correct.)

15. [ ]

16. [ ]
    [ ]

17. [ ]
    [ ]

18. [ ]
    [ ]
    [ ]

[ ]

Finding your score for the multiple choice questions A - E

Count the number of correct answers you selected (All answers that begin with the word "Correct.")

Number "Correct" = _____ (Line 1)

Count the number of incorrect answers you selected and subtract that number from 7. (All incorrect answers begin with something other than "Correct.")

7 - _____ = _____ (Line 2)

Add the numbers in Lines (1) and (2) to get your total score = _____ (Line 3)
Highest possible score = 18 Lowest possible score = 0

Please turn the page and complete <u>both</u> pages of the questionnaire.
Your answers to all questions are needed to improve the story.
Leave the completed questionnaire attached to this answer booklet.

Evaluation Form: *Off To A Late Start*

Date ___-___-___

Think about the story you just finished. Circle the number that best shows how much you agree or disagree with each statement.	Definitely No 1	2	3	4	Definitely Yes 5
1. This story is a realistic case.	1	2	3	4	5
2. I enjoyed working through the story.	1	2	3	4	5
3. The construction activities described in this story are realistic.	1	2	3	4	5
4. The people in this story are like people I have worked with.	1	2	3	4	5
5. The economic information provided in the story is realistic.	1	2	3	4	5
6. The instructions were easy to follow.	1	2	3	4	5
7. The story took too long to complete.	1	2	3	4	5
8. The story taught me new ways of thinking about the relationship between injury and economics.	1	2	3	4	5
9. Working through the story will help me size up hazards on the job.	1	2	3	4	5
10. Working through the story will help me take action to reduce hazards on the job.	1	2	3	4	5
11. Working through the story will help me make better judgments about safety when there is pressure to get a job done.	1	2	3	4	5
12. What I learned in the story will help me to prevent injuries on the work site.	1	2	3	4	5

	Definitely No				Definitely Yes
	1	2	3	4	5
13. The questions and answers were well written.	1	2	3	4	5
14. The story helps me understand the tradeoffs between my own risk of injury and pressure to complete the job.	1	2	3	4	5
15. The story helps me understand the tradeoffs between the risk of injury to coworkers/ employees and pressure to complete the job.	1	2	3	4	5
16. The story will help me create a safer work environment in our company.	1	2	3	4	5
17. Working through the story helps me to understand the impact of injury on productivity.	1	2	3	4	5
18. Working through this story helps me to understand my boss' / employees' perspective.	1	2	3	4	5
19. The picture was easy to understand.	1	2	3	4	5
20. Safety suffers when you're under pressure to make up for lost time.	1	2	3	4	5

Master Answer Sheet for Off To A Late Start

Read the questions in the exercise problem booklet. Use this answer sheet to mark your answers. Rub the special marker pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get all the information you need.

Question A (Select as many as you think are correct.)

1. [Correct – Ladders, like all equipment, should be inspected on a regular basis to make sure they are safe.]

2. [Correct. Electrical power lines should be avoided at all times, even if the ladder has nonconductive siderails. Frank should so this and also teach his workers to make this inspection every day before they use a ladder.]

3. [Correct. If positioned or secured incorrectly, ladders can "walk out from under" someone.]

4. [Only approved walkboards that are at least 12" wide should be used. Horizontal ladders are not safe or adequate for walkboards.]

5. [Correct. Pete and Gary are not experienced and have only been with Frank a short while. They may not have the skills or experience to set the ladders & walkboards up correctly.]

6. [Pete and Gary are too inexperienced. This may encourage them to attempt more than they know how to do safely.]

Question B (Choose only one answer unless directed to "Try again.")

7. [The problem will be solved this time but Pete and Gary won't realize they didn't set up properly. Try Again.]

8. [The problem will be solved for now, but Pete and Gary may not understand what they did wrong or how the ladders should have been set up. Try again.]

9. [A safety problem should be fixed when it is recognized. Putting it off until later is risky. If they get busy, Owen may forget to tell Frank. Try again.]

10. [Correct. This is the best way for Owen to help Pete and Gary learn how to set up ladders properly.]

Question C (Select as many as you think are correct.)

11. [Correct. Frank doesn't have anyone with experience bidding. Unless]
[he can train one of his workers in a hurry, his difficulty getting]
[around could have a financial impact on the company.]

12. [Correct – The time it takes him to hire and train another worker is a]
[hidden cost of the injury, especially if the new worker is not]
[experienced or is not dependable.]

13. [Because Frank was not covered, his injury won't affect the]
[company's premium. However, this one injury could cost him far]
[more than he 'saved' by opting out.]

14. [Correct – If his ankle does not heal 100%, he may not be able to do]
[this kind of work in the future.]

Question D (Select as many as you think are correct.)

15. [Correct. You should never climb on anything you haven't checked.]

16. [Correct. New employees may not have the knowledge or experience]
[to protect themselves or their coworkers from injury.]

17. [This is probably not a feasible option. Experienced workers may not]
[be available when there's a need for more help.]

18. [Correct. This would let the workers know that safety is a priority, and]
[provide them with the skills and knowledge they need to work in a]
[safer manner. It doesn't have to be expensive to be effective.]

Appendix E. Year 2 Newsletters

Young and inexperienced worker: Protecting them from injury and preventing costly claims.

The Hidden Costs of Injuries!

A Formal Safety Program for a Small Construction Company?

It's not necessarily how much you lift, but how you lift it!

Building a Safe Work Team

Avoid Back Injury. Warm-Up

Back Belts

Kentucky Injury Prevention and Research Center
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SAFE SITE

A monthly newsletter provided by the Kentucky Employers' Mutual Insurance Company's Loss Education Department and the KY Injury Prevention and Research Center.

Issue 01

Kentucky Employers' Mutual Insurance
http://www.KEMI.com

Young and inexperienced workers: Protecting them from injury and preventing costly claims.

"Good help is hard to find!" That's a saying we hear regularly and it is often the case in the construction industry. Occasionally when a construction company is short-handed and needs to hire another employee, the only people who are available and willing to work are young and inexperienced workers. Hiring young and inexperienced workers gets "young blood" into the company and provides young workers with an opportunity to learn a trade. However, these workers often lack the skills and knowledge to do a quality job and do it safely.

There is a common misperception that young workers are strong and won't injure themselves, especially their back. Another common misperception is that even if they do hurt their back, younger workers recover quickly. These misperceptions may result in injury and pain to the younger worker and a costly claim for the company owner. In a recent survey, KY chiropractors said that young construction workers tend to have strong arm and leg muscles but have underdeveloped stomach, back, and buttock muscles. This puts them at risk for a painful and costly back injury.

Younger workers often aim to please. They sometimes want to show the boss that they are a hard worker and can work independently. This means that they may try to do too much to impress their supervisor and they lack the knowledge and experience to be able to determine what tasks they can complete safely. This is why it is especially important to team up inexperienced workers with experienced workers, who can teach the knowledge and skills required to do a quality job safely.

In addition, the experienced worker can help determine when the inexperienced worker is ready for more responsibility.

We received several tips from KY construction workers on how to coach young and inexperienced workers, keeping them injury free and keeping the company from the harsh impact of claims. Here are just a few of the tips:

- Let workers know that safety is a priority.
- Reward safe behaviors.
- Encourage them to work at a safe and steady pace and not to hurry. Hurrying often results in sloppy and unsafe work.
- Give an occasional verbal reminder to be safe.
- Team inexperienced workers up with experienced workers. Not only can experienced workers teach them safe work habits but they can also help make the decision to give the younger worker more responsibility.
- Always provide them with the appropriate personal protective equipment, such as safety glasses, ear plugs, etc.
- Be sure to teach them the safety hazards of equipment and machinery. They may not be familiar with the equipment and how it can injure them.

Following these tips may protect young and inexperienced workers from getting injured, keeping them healthy and productive. Young workers have the right to learn a trade without being constantly exposed to unsafe situations. After all, these young workers will be the future leaders of the construction industry.

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Issue 02

Kentucky Employers' Mutual Insurance
http://www.KEMI.com

The Hidden Costs of Injuries!

Jim, a carpenter in central KY for more than 20 years, was replacing parts of a rotten two story deck on a summer morning. While walking up the stairs to the upper level deck, the stairs dislodged. Jim lunged for the upper deck but was unable to reach them. He fell 15 feet onto a stone wall, fracturing his ribs in 11 places and puncturing one lung. He was taken to an emergency department by ambulance and spent 10 days in the hospital.

Jim was glad that the injury wasn't any worse than it was. Jim was covered by his wife's health insurance which paid almost all of his hospital bill and he had to pay only $5 for each prescription.

Jim had opted out of workers' compensation as a general contractor and owner of his construction company. So he knew he wouldn't be getting any wages for the four weeks he was unable to work. Jim considered himself lucky for just losing his wage for those four weeks, paying $5 for each prescription, and the small hospital bill. However, Jim was just beginning to learn about the hidden costs of injuries.

Jim had two crews working for him at that time and he served as the lead carpenter on one of those crews. The other crew was headed up by an experienced carpenter who Jim trusted completely and this crew functioned just fine in Jim's absence. However, since Jim wasn't bidding any work at that time work soon ran out for this crew and two of his crew members left because they needed work.

The other crew was in the middle of building a house with a complicated roof system. The crew members lacked the skills and experience to do it but they tried anyway and much of it needed to be redone. Because of this, he lost the trim contract for the house.

So Jim's financial worries just started with the hospital and prescription bills. He lost workers and jobs during this time and his reputation for quality work suffered.

Hidden costs of injury are in many instances more than the injury costs. In fact, some well-known economists estimate that the ratio is 4:1. Which means that for every $1 of the direct injury costs you can expect to pay $4 in hidden costs. The following is just a short list of some of the potential hidden costs of an injury:

- Need to hire and train new workers.
- Inability to complete current or future contracts.
- Company's reputation may suffer.
- Higher workers' compensation premiums.
- Lower weekly wage from workers' compensation..
- Inability to bid work.
- Crew may have to work short-handed.
- Injured person may not recover 100%.
- Risk of re-injury or relapse.
- Inability to make payments on machinery or equipment.
- May lose workers due to lack of work.
- Productivity and morale of crew may decrease after seeing a crew member get injured.
- Injury may result in damaged materials or equipment.
- Company or personal credit can be ruined.

These are just some of the potential hidden costs of a work-related injury. Controlling injuries and their associated hidden costs are essential to the survival of any company. Small injuries can have a huge impact on a construction company. That is why it is imperative that each company make safety a priority for the benefit of the workers and the economic survival of the company.

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Issue 03

Kentucky Employers' Mutual Insurance
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A Formal Safety Program for a Small Construction Company?

In 1996, employees from the Kentucky Injury Prevention and Research Center and Kentucky Employers' Mutual Insurance traveled throughout KY to discuss safety matters with groups of owners and workers from small construction companies. We asked them about the most common injuries they had seen, the most dangerous jobs they do, as well as what steps they take to make work safe in their company. We were pleasantly surprised to hear that safety was a high priority for many companies.

We frequently asked groups if their company had a formal safety program. The most common response was, "We're too small." We were surprised to hear that these companies who take a great deal of pride in their safety records didn't have a formal safety program. We eventually figured out why. People view a formal safety program as an expensive, time-consuming, and technical endeavor. Having a formal safety program simply means that a company has written standards regarding safety that are put into practice on a daily basis.

Safety programs can be very involved and require bringing on extra staff for a large company. For small companies, however, a safety program can be developed and implemented relatively easy.

Formal safety programs can:

- inform employees that safety is a priority
- reduce workers' compensation premiums
- reduce the number of costly injuries
- make employees aware of the company's expectations regarding safe work practices
- illustrate to potential employers that safety is a priority in your company.

These are just a few of the benefits of formal safety programs. Now, let's look at some of the components of a safety program.

Written safety policy: formalizes the company's policy on safety matters; can be read and signed by each employee.
Toolbox/tailgate meetings: meetings held at regular intervals to discuss important safety matters or conduct training.
Safety literature: posters or brochures displayed in work areas or distributed to employees that serve as safety reminders.
Safety incentives: simple incentives such as pizza luncheons for each injury-free month. Incentives are given for productivity, why not safety?
Training: can include new employee training or training on safe work practices, machinery, personal protective equipment, or a host of other safety issues.
Injury investigations: conducted to determine cause of injuries and necessary steps to prevent these occurrences in the future.
Return to work/light duty program: gets employees back to work while keeping them within their doctor's restrictions.

These are just a few of the possible components of a safety program. KEMI's Loss Education Department will be glad to assist you in developing a safety program that meets the needs of your small company. You can reach them by calling 1-800-893-4751.

Don't think that safety programs are just for large companies. A formal safety program can be of great value to your company and may give you a competitive edge. Most importantly, it may keep you and others in the company injury-free and healthy.

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Issue 04

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IT'S NOT NECESSARILY HOW MUCH YOU LIFT, BUT HOW YOU LIFT IT!

There is a common misperception that a back injury is caused by one simple factor: the amount of weight that you lift. There are lots of scientific studies and testimonials from construction workers that prove this theory false. Experts agree that back injuries are caused not necessarily by how much you lift, but how you lift it.

We've had construction workers tell us many different ways they have hurt their back. Masons who lift heavy block and mortar day after day injure their backs by bending over to pick up a pencil. Carpenters who carry hundreds of pounds of lumber each day strain their backs lifting a single 2" by 4" stud. Stories like these are common in the construction trades.

Back injuries are common in our society. Between 80 and 90 percent of all Americans will injure their backs at least once in their lives. Back injuries are also very common in people who work in the construction trades. In the years 1994 and 1995, strains and sprains to the back accounted for 38.7% ($33.7 million) of the total expenditures for the construction industry paid by the Kentucky Department of Workers Claims.

Most of us know that back injuries are painful and are tough to cure. However, many of us don't know how to prevent them. The fact is most back injuries are preventable, especially those caused by improper lifting.

The back is most susceptible to an injury during lifting, whether it be something large or small. Proper lifting can prevent a workers physical and financial hardship over time.

There are specific rules you should follow every time you lift a load, no matter the size or weight.

1. **Clear your path** before starting to lift any load. Boxes, water, electrical cords and other hazards in your way equal back injuries waiting to happen.

2. **Check the load** and make sure you know what kind of load it is. If you can't handle it alone, get help.

3. **Use your legs.** Your large leg muscles, not your narrow back muscles, are designed for heavy lifting. Bend at the knees and lift with your legs.

4. **Maintain the natural curve of the spine** by arching your lower back and keeping your upper back straight when lifting. This keeps your shoulders and spine in an upright position, preventing injury.

5. **Exhale when you lift the load.** Tighten your abdominal muscles and exhale; this gives your back more support.

6. **Keep the load close to your body.** Trying to carry the load away from your body creates more force, increasing the weight of the object and increasing the likelihood of injury.

7. **Look up just before you lift**; this will keep your back and spine in correct alignment.

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Issue 05

Kentucky Employers' Mutual Insurance
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BUILDING A SAFE WORK TEAM

A construction crew is much more than a group of individuals working at the same site. They are a team working together to accomplish a lasting goal. Construction work requires a combination of physical strength, coordination, and careful planning. Although the contractor does most of the pre-planning, foremen and crew members have to plan, coordinate and carry out the necessary tasks. In order to complete the job safely, efficiently, and with good quality, there has to be cooperation and teamwork.

IT'S IMPORTANT TO BE A TEAM PLAYER!

One way to stress the importance of being a team player and working safely is through the use of Tailgate/Toolbox Meetings. These are on site 10-15 minute meetings focused on safety. The supervisor is like a coach whose responsibility includes making sure that everyone believes that they are an important player on the team. During these tailgate meeting employees can discuss work practices, machinery, tools, equipment, materials, attitudes, or other issues they believe may promote work-place safety. Tailgate/Toolbox meetings give the team leader the opportunity to address safety issues on a regular basis and also to remind everyone of the importance of team work.

Team Players:

- Look out for others, especially less experienced co-workers.
- Offer opinions and lend a hand.
- Recognize someone working with a heavy load.
    - Help or suggest a mechanical aid.
- Recognize improper or unsafe use of equipment.
    - Correct behavior.
    - Suggest issues for which further training may be needed.

Teamwork suffers when workers:

- Keep to themselves.
- Offer no advice or help to each other.
- Resent others for offering suggestions or guidance.

HOW TO RUN A GOOD TAILGATE/TOOLBOX MEETING

- Hold meeting on the job site.
- Hold meeting at the beginning of the shift, or after a break.
- Address safety issues that currently exist on the job.
- Choose a specific topic.
- Don't lecture. Encourage as much employee participation as possible.

Also important to discuss at a Tailgate/Toolbox meeting:

- Follow directions. Don't take chances; if you don't know, ASK.
- Correct or report unsafe conditions.
- Help keep the job site picked up and free of obstacles.
- Use the right tool and equipment for the job.
- Report all injuries.
- Don't engage in horseplay.
- Avoid distracting others.
- Give or get help for heavy loads.
- Comply with all safety rules and postings and encourage co-workers to do so as well.

For more information on Tailgate/Toolbox Meeting topics contact KEMI's Loss Education Department. You can reach them by calling 1-800-893-4751.

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Issue 06

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AVOID BACK INJURY WARM-UP

Four out of five people experience some sort of back pain in their lifetime. About 93 million workdays are lost each year to back injuries and pain. Unfortunately, work related back injuries don't stop when the job is done. Your life and your family's quality of life can also be affected by a back injury. You may be unable to return to work for a while, be unable to do the same type of work, or even be unable to enjoy leisure activities such as fishing, hiking, camping, or picking up your children or grandchildren.

One way to make yourself less likely to injure your back is to warm up before you start work. Warming up with the following exercises loosens tight muscles and makes the back more flexible. **STRETCH ONLY AS FAR AS YOU CAN COMFORTABLY. DO NOT OVERSTRETCH.**

1. Neck Flex - With shoulders relaxed, bend your neck forward **slowly** so your chin touches your chest. Then slowly bend your neck back as far as is comfortable. Repeat 5 times.

2. Neck Rotation - **Gently** turn your head to the right, looking over your shoulder and then to the left. Repeat 5 times.

3. Shoulder Extension - Standing with your feet shoulder width apart, clasp your hands behind your back. Push your arms out behind you and **hold** that stretch for 2 to 3 seconds. Relax and repeat 5 times.

4. Shoulder Flex - **Slowly** move your hands over your head and extend your arms fully. Clasp your hands with palms up. Raise your arms and inhale deeply. **Hold** this stretch for 2 to 3 seconds then release and exhale. Repeat 5 times.

5. Arm Circles - With your arms straight out to the side at shoulder level start circling arms in small circles, then **slowly** increase the size of the circles. Repeat this direction for 30 seconds, then reverse your circles.

6. Back Extension - Stand straight with feet shoulder width apart. Place your hands on your hips and **slowly** bend backward. Repeat 5 times.

7. Lower Back Flex - Sit in a chair with your knees placed shoulder width apart. Bend forward until you place your hands on the floor or as far as you can. **Hold** that stretch for 10 seconds and repeat 5 times.

8. Thigh Stretch - Support yourself by using a chair or wall. Grab the right foot in the right hand and pull your heel toward your backside, feel the stretch in the thigh. **Hold** for 10 seconds then release the foot and change to the other foot.

9. Hamstring Stretch - Place your right foot on a chair and grasp your ankle or knee with your hands. Bend forward and feel the stretch in the hamstring and calf muscles. **Hold** for 10 seconds then repeat with the opposite leg.

10. Heel Stretch - With your hands on your hips, take a large step with your right foot. Be sure and keep both heels on the ground. **Gently** move your torso forward and feel the stretch in the calf muscle. **Hold** for 5 to 6 seconds then switch feet.

The few minutes you take every day to warm up your back could save you years of discomfort, pain and disability.

Exercises taken from ACTIVIZE Inc., Kinnelon, NJ. Http://www.inetmall.com/shops/backstage/history.htm

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BACK BELTS

Back injuries account for nearly 20% of all injuries and illnesses in the workplace and cost the nation an estimated 20 to 50 billion dollars per year. In response to the increasing human and economic costs of back injury, companies have implemented numerous measures including the use of industrial back belts. It is a personal choice to wear a back belt, but everyone should have the best available information to make that decision.

THE JURY IS STILL OUT

There have been numerous studies done on the effectiveness of back belts in decreasing injury. However, results of these studies don't agree with each other others. Therefore, there is not enough information to either support or refute the effectiveness of back belts in injury reduction. If you decide to make use of back belts, it is always important to have a training program on the proper use of them as well as any other type of personal protective equipment. There is no type personal protective equipment that should be used to take the place of good safety habits and proper technique.

If you do decide to use a back belt you should:

- Understand the pros and cons of using a back belt.
- Be trained on how to lift and how to use the belt
- Cinch up the belt only when lifting. Belts should be unbuckled between lifts.
- Keep your back and abdominal muscles in shape so wearing the belt doesn't weaken them.

It is also important to maintain your back belt properly. You should:

- Inspect and test belts and hardware carefully before use.
- Never weaken the belt or strap by cutting, altering or by rough-punching extra holes.
- Never drop it or leave it on the ground.
- Keep it away from sharp tools or other objects that might scratch, cut, or catch on it.
- Do not expose back belt to extreme cold or heat
- Store back belt in a dry compartment or hang them so they are not crushed, worn, creased, or bunched up.

DON'T PUT ALL YOUR EGGS IN ONE BASKET

If you are putting all your prevention resources into back belts you may not be adequately protecting yourself or your workers. The National Institute of Occupational Safety and Health (NIOSH) does not recommend the use of back belts for injury reduction. Rather than rely solely on back belts, NIOSH recommends that companies implement training that focuses on redesigning the work environment and work tasks to reduce the hazards of lifting, as well as training workers to identify lifting hazards and to use safe lifting methods. Companies and individuals should not rely on back belts as a "cure all" for back injury, but should begin to undertake prevention measures which reduce the risk of lifting tasks.

Appendix F. Year 3 Newsletters

Slips, Trips, and Falls

Ladder Safety

Scaffolds

Personal Fall-Protection

An ounce of prevention is worth a pound of cure.

Heat Stress

Construction on the Wold Wide Web

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SLIPS, TRIPS, and FALLS

According to The National Safety Council, one in every six reported workplace injuries are slips, trips, or falls. More than 200,000 people in the United States are injured on the job these ways every year. Most employees who are injured due to slips, trips, or falls are between the ages of 20 and 44 and have worked for their employers for more than a year. The average cost of a single slip and fall related injury is nearly $13,000. Falls are also the leading cause of deaths and a leading cause of injuries in the construction industry and they may contribute to higher workers' compensation costs.

SLIPS

Slips occur when there is too little friction or traction between your feet and the surface you are walking on.

Common Causes

- Constantly Wet Surfaces
- Occasional Spills
- Weather Hazards

To Avoid Slips

- Shorten your stride for better balance.
- Walk with your feet pointed slightly outward to create a stable base.
- Wear slip resistant footwear.
- Use abrasive strips to increase traction.
- Post signs to warn of wet areas.
- Clean up spills when you see them. If this is not possible, draw attention to the spill in some way so that others will see it and go around. **REPORT the spill to the appropriate person immediately!**

TRIPS

Trips occur whenever your foot strikes an object and your momentum causes you to be thrown off balance.

Trips Happen When

- Your view is obstructed.
- You take a shortcut instead of using a proven path.
- There is clutter in or near the walkway.

To Avoid Trips

- Create a clear and noticeable path between materials and equipment.
- Stack all materials neatly without protruding boxes, cans, etc.
- Tape down all extension cords.
- Make sure you can see around any load you are carrying.

FALLS

Falls occur as the result of slips and trips. They may also be the result of improper use of ladders, scaffolds, etc.

To Avoid Falls

- Eliminate hazards that could result in slips and trips.
- Take the time to get the proper equipment for the job.
- Use the equipment properly.

Many slips, trips, and falls can be prevented with good worksite maintenance habits. It is important to recognize potential hazards and to take immediate action to take care of them. Take all near injuries seriously. Take the time to see why the near accident occurred and identify what can be done to prevent it from happening again.

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LADDER SAFETY

A large number of constructions jobs require the use of a ladder. Two of the most common causes of falls are using ladders improperly and using makeshift ladders. Whether it's used for regular work duties or routine maintenance, make sure your employees know how to use a ladder safely.

Plan Ahead

- Get the right size ladder for the job. Check the duty rating.
- Make sure the work can be done safely from a ladder. If not, use a scaffold.
- Call the electric company for assistance if working near power lines.

Inspect Ladders Before Using

- Check for loose, cracked or greasy rungs, split side rails and worn shoes. Make sure the rung locks are in working order.
- Tag and remove defective ladders from the job site.

Preparing To Use The Ladder

- Position the ladder, then make sure all of its feet are on the floor and that the spreader's safety latches are locked in place.
- Barricade the door and post warning signs if a ladder must be placed in or above a doorway.
- Do not use a ladder for skids, braces, workbenches, or for any purpose other than climbing.
- Do not use a ladder in a horizontal position as a scaffold.
- Do not use metal ladders near electric lines or services.
- Do not place tools or materials on steps or the platform.
- Have another person hold the ladder or tie it off if it's over 8 ft. high.

When Using The Ladder

- Keep both feet on the ladder rungs at all times.
- Do not work from a closed stepladder.
- Never stand on the platform or top step of a stepladder.
- Make sure you are facing the ladder when you are working from it. If you must work backwards from a ladder, a safety belt is necessary or rotate the ladder.
- Only one person per ladder at all times.
- Do not over load. Ladders can only carry up to 250-300 lbs. (type I or IA), including materials and a person.

Extension Ladders

Extension ladders, because of their height, have the potential of causing a serious fall if misused. To prevent a possible life-threatening fall follow these guidelines.

- Follow the 1 to 4 rule. Set the base of the ladder 1 foot out from the wall for every 4 feet of ladder height.
- To keep the ladder from slipping have someone hold the base or tie off the ladder securely.
- When working on a roof, the ladder should be extended 3 feet beyond its contact with the building. Never use the top three rungs.

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SCAFFOLDS

Working at heights is a common situation for construction workers. Many injuries are a result of falling from one level to another. Any fall can be fatal! Scaffolds can provide a safer and more efficient way to work. But scaffolding must be properly set up. A poorly constructed scaffold is as dangerous as not using a scaffold at all. If you use scaffolding make sure that the person setting it up has been trained properly. It is also important to inspect the scaffolding every time before you use it.

General Provisions for all Scaffolds

- Provide access ladder.
- Use scaffold grade lumber.
- Install guardrails and toeboards on all scaffolds 10 feet above the ground.
- Train all personnel in safe use.
- Ensure structure is capable of supporting 4 times the maximum intended load, including its own weight.
- Beware of electrocution hazards when assembling, using or dismantling scaffolds near power lines. Call electric company for assistance.

Tubular Welded:

- Assemble scaffold by qualified person.
- Cross brace the scaffold.
- Secure to building.
- Install guardrails.
- Provide access ladder.
- Fully plank.

CAUTION: Careful footing is critical for the stability of these scaffolds.

Pump Jack Scaffold

- Use wooden poles up to 30 feet; aluminum poles up to 50 feet.
- Install guardrails. Workbench may serve as top guardrail.
- Secure poles to house with rigid triangular bracing at the top, bottom and other points as necessary.
- Make sure poles are plumb.
- Platforms brackets should be fully planked and secured.
- Do not sit or stand on workbench platforms.

CAUTION: Spliced 2x4 poles often slip when wet.

Ladder Jack:

- Do not use over 20 feet in height.
- Platforms should be a minimum of 12 inches wide. Do not bridge platforms to each other.
- Secure ladders to prevent slipping.
- Provide access ladder.

CAUTION: The least safe of all staging types. Try to minimize use. OSHA now requires fall protection to be used on these scaffolds.

CAUTION: Never combine pump jack scaffolds with ladder jacks unless you do not intend to adjust the height of the pump jack.

Carpenter's Bracket:

- Platform must be minimum of 12 inches.
- Ensure brackets are attached to the stud or structural member of building.
- Install guardrails.

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PERSONAL FALL-PROTECTION

Falls from high places frequently cause serious injury or even death. Personal fall-protection equipment can improve the workers safety. Unfortunately, workers fail to use any protective equipment or use the proper equipment incorrectly. The occupational safety and health administration (OSHA) estimates that these mistakes kill 300 people every year. These deaths can be avoided. The worker must hook up whenever there is any danger of falling.

Types Of Personal Fall-Protection Systems

- **Personal Fall-Arrest**
  - Catch workers after they have fallen.
- **Positioning Devices**
  - Help prevent falls by supporting the employee in a working position.
- **Personal Fall-Protection Systems for Climbing Activities**
  - Protect the worker while they are climbing.

ALWAYS REMEMBER

- Make sure you use the proper equipment for the job.
- Follow manufacturer's instructions on how each item is to be used.
- Use equipment for it's intended purpose only.

Care And Inspection Of Equipment

Keeping equipment in good working order makes things safer for everyone. Defective equipment must be identified and replaced at once.

- Inspect all personal fall-protection systems before each use.
- Set up a schedule for more formal inspections.
- Equipment that has stopped a fall must be inspected before it can be used again.

During Regular Inspections

- Check all equipment for wear, damage, mold, mildew or distortion.
- Make sure no straps are cut, broken, torn or scraped.
- Check for damage from fire, acid or other corrosives.
- Hardware should be free of cracks, sharp edges or burrs.
- Snap hooks should close and lock tightly.
- Buckles should work properly.
- Check ropes for wear, broken fibers, pulled stitches and discoloration.
- Make sure lifeline anchors and mountings are not loose or damaged.
- Check manufacturer guidelines for inspection. If any item is damages or defective, remove it from service at once. It should be either destroyed or marked as unusable.

SELECTION TIPS

- Do your homework. Know exactly what types of hazards your workers face that could cause them to lose their footing.
- Know what the workers really need.
- Remember ease of use. Slip and fall protection, as with all safety products, is worthless if it is not used.
- Workers will not use safety devices if they are difficult to wear or interfere with work.
- Training makes a difference. Safety devices are much more effective if they are thoroughly explained and demonstrated to users. Training is needed to get the maximum effect and long life out of the product.

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AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE

The construction industry is full of hazards that cause injuries to a large number of workers every year. On average the injury rates for the construction industry as a whole are 40% higher than the average for all private industry, according to Bureau of Labor Statistics' Annual Survey of Occupational Injuries and Illnesses. Much needs to de done to reduce construction-related injuries, particularly among small firms.

To decrease the number of accidents it is important to know and follow safe work procedures. It is everyone's responsibility to make the work site as safe as possible. If safety concerns are an every day habit, fewer workers would be injured.

- If you do not know the proper safety procedures, ask someone for help.
- Work safely and encourage others to do the same.
- Look out for your own safety and the safety of others.
- Advise you supervisor of unsafe conditions.

When you work safely, you set a good example for others. They will be encouraged to work safely too.

To do your work safely, you must:

- Keep your eyes open.
- Keep your mind on your work.
- Listen to advice about safety.
- Obey safety rules and regulation.

Not working safely leads to mistakes on the job. Mistakes lead to lost time and money. An even worse situation could result in an injury which could mean medical costs, lost work, lost wages, or even permanent disability. When you think of safety you have to consider both physical and economic factors. A few simple day to day reminders can improve your safety.

Planning

- Planning makes it possible to handle your workload most efficiently.
- Keeps workers from being in a hurry and getting fatigued. Hurrying and fatigue can lead to injury and decreased quality of work.

Checking Equipment

- Equipment should be inspected before every use. Using damaged or broken equipment is also a risk for injury.

Work Site Condition

- Keeping the work site orderly will make the work day more efficient.
- Clutter is a definite injury risk.
- The few minutes taken to clean up your mess could save a lot of time and money in the long run if it helps to avoid injuries.

What Does Safety Mean?

Safety means remembering the safety rules set up by your company and applying them every minute of every day when you are on the job.

Safety means consideration for the family that depends on you , for the company that employs you, and for your own welfare.

REMINDER- A single risk, might mean an accident from which you might never recover!

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HEAT STRESS

Heat is a serious hazard in construction. Your body builds up heat when you work and sweats to get rid of extra heat. If you are up on a roof, pouring hot asphalt, or lifting heavy loads, your body may not cool off fast enough. Too much heat can make you tired, hurt your job performance, and increase your chance of injury. The frequency of accidents is higher when working in a hot environment for these reasons. The key to preventing excessive heat stress is educating employers and workers on the hazards of working in heat and to notice the signs of a heat related illness. There are a number of problems to be on the look out for when working in the heat.

Heat Exhaustion: Heat exhaustion is the stage before heat stroke. It is caused by the loss of large amounts of fluids by sweating.

Signs Of Heat Exhaustion

- Still Sweating
- Tired
- Nauseous
- Headache
- Dizzy
- Skin is Clammy and Moist
- Skin Looks Pale or Flushed
- Body Temperature is Normal or Slightly High

In more serious cases:

- Vomiting
- Lose of Consciousness

In most cases, recovery results from resting in a cool place and drinking lots of liquids. Those with more serious cases may need a few days to recover.

Heat Stroke: Heat stroke is the most serious of health problems when working in a hot environment. It occurs when the body's temperature control system fails. Sweating is no long enough to cool the body.

Signs Of Heat Stroke

- Hot Dry Skin
- High Temperature
- Confused
- Convulsions
- Unconscious

Heat stroke can **KILL** you unless you get emergency medical help immediately!

Dehydration: When your body loses water, you can't cool off fast enough. You feel thirsty and weak.

Cramps: Heat cramps result from excessive sweating, drinking large amounts of water, but not replacing the body's salt loss. You can get muscle cramps from the heat even after you leave work.

Protect Yourself From Heat Illnesses

- Drink a lot of cool water all day. **BEFORE YOU FEEL THIRSTY!**
- Keep taking rest breaks. Rest in a cool, shady spot.
- Wear light-colored clothing made of cotton.
- Do the heaviest work in the coolest time of day.
- Work in the shade.
- If you work in protective clothing you need more rest breaks.
- If someone shows signs of heat stroke **CALL** emergency services. While waiting, move the worker to the shade, soak clothing with water, and fan to increase cooling.

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CONSTRUCTION ON THE WORLD WIDE WEB

Everything is becoming computerized. More and more Internet (or "net" for short) and world wide web are household words. A growing number of people have computers in their homes with Internet access and if not, the local library has some for public use. The Internet is easy to use even for the beginner!

Even the construction industry has gotten into the game. There are more than 6000 web sites about construction safety as well as construction products and companies. We have searched the net over and put together a list of sites that are helpful and informative.

The Kentucky Injury Prevention and Research Center (that's us) has put the Safe Site Newsletters on their web page at **http://www.kiprc.uky.edu.** Other occupational safety information can also be viewed there.

Kentucky Employers' Mutual Insurance (KEMI) also has a web page at **http://www.kemi.com**. KEMI's Loss Education Unit is dedicated to helping you make your workplace safer and more efficient. They offer training on a large number of topics. Check out there web page and let them know how they can serve you.

Other Construction related sites to check out.

http://www/cpwr.com
Center to Protect Workers' Rights
- Project Safety and Health Management
- Hazard Alerts
- New Developments in Workers Compensation Programs

http://www.buildsafe.org
Construction Safety Council
- Construction Safety Sites From Around the World.
- Construction Safety News
- Small Business Links
- Hazard Alert Bulletins

http://www.compusmart.ab.ca/acsa/
Alberta Construction Safety Association
- "quality advice" to reduced human and financial costs associated with incidents in the construction industry

http://www.osha.gov
Occupational Safety and Health Administration
- Safety and Health Regulations for Construction
- Provides readily accessible technical information to assist worker, employers and safety and health professionals in reducing occupational injuries and illnesses.

http://www.open.gov.uk/hsehome.htm
Health and Safety Executive
- Construction Health and Safety Checklist
- Information About Risks at Work

http://www.nsc.org
National Safety Council
- Job Safety and Health
- Free Safety Training

http://www.who.ch
World Health Organization

You can also find companies that sell safety products.

This is just a place to start. There is much more out there on the "net". Don't be afraid, it's easy to surf the "net". Spend some time and find out what's going on in your field around the world.

Appendix G. Year 2 Surveys

Pre-Test (Green)

Immediate Post Test (Pink)

Delayed Post Test w/ Retrospective Pre-Test (White)

Control, Agree No Return and Decline (Blue)

CONSTRUCTION SAFETY PROJECT
GREEN SURVEY

1. What is your age?	_____ Years
2. How many years of school have you completed?	_____ Years
3. Do you have primary financial responsibility for one or more children or dependent adults?	____No (If No, skip to question 4) ____Yes (If Yes, how many?) _____Children _____Dependent Adults
4. How many years have you worked in any kind of construction? (Not just the particular job you do now.)	_____ Years
5. On average, how many months out of a year do you work in construction?	_____ Months
6. On average, how many hours per week do you work in construction?	_____ Hours per week
7. What is your position where you work? (Check the one that applies most to your usual position.)	_____Owner ____Supervisor/Foreman _____Employee
8. How many years have you worked for your present company?	_____Years
9. In your entire career in construction, how many on-the-job injuries have you had that required medical treatment or made you miss at least a day of work?	_____ Injuries (If 0, skip to question 10)
10. How many on-the-job injuries did you have in the last year which have required medical treatment or made you miss at least one day of work?	_____ Injuries
11. How many times in the last year would you say written safety materials were given to employees where you work?	_____Times
12. How many times in the last year would you say meetings were held to discuss safety issues where you work?	_____Times

For the following three questions (12-14), please place a mark on the line to indicate where you would rate yourself or your company right now.

Example:

Where I work, people take shortcuts that make work less safe.

Never |—/———————————————| Every day

(The mark on the line indicates that this hardly ever happens.)

13. In our company, employees feel that doing the job safely is as important as getting the job done.

Never |_____| At all times on every job

14. I am confident in my ability to make work as safe as possible for myself and my co-workers.

Never |_____| At all times on every job

15. I believe that hurrying to get the job done costs more in the long run.

Totally Disagree |_____| Totally Agree

Please circle the number that shows how much you agree or disagree with each of the following statements.	1 = Strongly Disagree	2 = Disagree	3= Slightly Disagree	4= Slightly Agree	5 = Agree	6 = Strongly Agree
16. Back support belts are the best way to prevent back injuries.	1	2	3	4	5	6
17. Cleaning up a cluttered work site is not usually worth the time or trouble.	1	2	3	4	5	6
18. Financial pressures keep companies like ours from doing things as safely as possible.	1	2	3	4	5	6

Please circle the number that shows how much you agree or disagree with each of the following statements.	1 = Strongly Disagree	2 = Disagree	3= Slightly Disagree	4= Slightly Agree	5 = Agree	6 = Strongly Agree
19. Experienced workers have enough common sense that they never need to be reminded about how to do things safely.	1	2	3	4	5	6
20. When I see someone doing something unsafe, I feel I am able to take some action to make the situation safer.	1	2	3	4	5	6
21. Working at a steady pace is one of the best ways to keep people from getting injured on the job.	1	2	3	4	5	6
22. Working closely with an experienced worker is one of the best ways for less experienced employees to develop safe work habits.	1	2	3	4	5	6
23. Sometimes even experienced workers do not pay close enough attention to the job they are doing.	1	2	3	4	5	6
24. When I think a worksite is not safe, I feel confident that I can figure out a way to make it safer.	1	2	3	4	5	6
25. Putting up safety posters in work areas is the best way to let employees know that safety is a priority.	1	2	3	4	5	6
26. It is worth the time and trouble to make sure you have the right tools for a job before starting any task.	1	2	3	4	5	6

Please circle the number that indicates your opinion of <u>how often</u> each statement applies to you or your work.	1 = Hardly Ever	2= Not Often	3 = Fairly Often	4 = Often	5= Very Often	6 = Almost Always
27. Everyone works together as a team to make work conditions safe.	1	2	3	4	5	6
28. I take the time to plan out what is necessary to do a job safely.	1	2	3	4	5	6
29. Supervisors and employees freely share their concerns and ideas about safety on the job.	1	2	3	4	5	6
30. We work short-handed.	1	2	3	4	5	6
31. We take the time and trouble to make worksite conditions as safe as possible before starting any job.	1	2	3	4	5	6
32. Supervisory personnel communicate that keeping safe is as important as getting the job done.	1	2	3	4	5	6
33. Experienced workers take the time to show less experienced workers the safest way to get a job done.	1	2	3	4	5	6
34. I feel capable of making good decisions about what safety equipment is needed to get a job done safely.	1	2	3	4	5	6
35. Financial pressures keep me from doing things as safely as possible.	1	2	3	4	5	6

CONSTRUCTION SAFETY PROJECT
PINK SURVEY

Please place a mark on the line to indicate where you would **now** rate yourself or your company **at the present time**, based on what you feel you have learned by completing the simulation stories.

Example:
Where I work, people take short cuts that make work less safe.

Never |—|———————————————| Every Day

(The mark on the line indicated that this hardly ever happens.)

1. In our company, employees feel that doing the job safely is as important as getting the job done.

Never |_____| At all times on every job

2. I am confident in my ability to make work as safe as possible for myself and my co-workers.

Never |_____| At all times on every job

3. I believe that hurrying to get the job done costs more in the long run.

Totally Disagree |_____| Totally Agree

Name _____

Address _____

City _____ State _____ Zip code _____

Phone number (_____) _____ - _____

PLEASE FILL OUT AND RETURN WITH OTHER MATERIALS.

CONSTRUCTION SAFETY PROJECT FOLLOW-UP SURVEY

Please circle the number that shows how much you agree or disagree with each of the following statements.	1 = Strongly Disagree	2 = Disagree	3= Slightly Disagree	4= Slightly Agree	5 = Agree	6 = Strongly Agree
1. Back support belts are the best way to prevent back injuries.	1	2	3	4	5	6
2. Cleaning up a cluttered work site is not usually worth the time or trouble.	1	2	3	4	5	6
3. Financial pressures keep companies like ours from doing things as safely as possible.	1	2	3	4	5	6
4. Experienced workers have enough common sense that they never need to be reminded about how to do things safely.	1	2	3	4	5	6
5. When I see someone doing something unsafe, I feel I am able to take action to make the situation safer.	1	2	3	4	5	6
6. Working at a steady pace is one of the best ways to keep people from getting injured on the job.	1	2	3	4	5	6
7. Working closely with an experienced worker is one of the best ways for less experienced employees to develop safe work habits.	1	2	3	4	5	6
8. Sometimes even experienced workers do not pay close enough attention to the job they are doing.	1	2	3	4	5	6

Please circle the number that shows how much you agree or disagree with each of the following statements.	1 = Strongly Disagree	2 = Disagree	3= Slightly Disagree	4= Slightly Agree	5 = Agree	6 = Strongly Agree
9. When I think a worksite is not safe, I feel confident that I can figure out a way to make it safer.	1	2	3	4	5	6
10. Putting up safety posters in work areas is the best way to let employees know that safety is a priority.	1	2	3	4	5	6
11. It is worth the time and trouble to make sure you have the right tools for a job before starting any task.	1	2	3	4	5	6

Please circle the number that indicates your opinion of <u>how often</u> each statement applies to you or your work.	1 = Hardly Ever	2= Not Often	3 = Fairly Often	4 = Often	5= Very Often	6 = Almost Always
12. Everyone works together as a team to make work conditions safe.	1	2	3	4	5	6
13. I take the time to plan out what is necessary to do a job safely.	1	2	3	4	5	6
14. Supervisors and employees freely share their concerns and ideas about safety on the job.	1	2	3	4	5	6
15. We have to work short-handed.	1	2	3	4	5	6
16. We take the time and trouble to make worksite conditions as safe as possible before starting any job.	1	2	3	4	5	6

Please circle the number that indicates your opinion of <u>how often</u> each statement applies to you or your work.	1 = Hardly Ever	2= Not Often	3 = Fairly Often	4 = Often	5= Very Often	6 = Almost Always
17. Supervisory personnel communicate that keeping safe is as important as getting the job done.	1	2	3	4	5	6
18. Experienced workers take the time to show less experienced workers the safest way to get a job done.	1	2	3	4	5	6
19. I feel capable of making good decisions about what safety equipment is needed to get a job done safely.	1	2	3	4	5	6
20. Financial pressures keep me from doing things as safely as possible.	1	2	3	4	5	6

We would like you to rate each of the following statements in two ways:
(a) How you think things are right now; and
(b) How you now think that things were four months ago (before you began to take part in this project).
For each statement, please mark the line to indicate your rating for each time.

Example:

(a) At the present time:
Where I work, people take shortcuts that make work less safe.

Never |——|——————————————| Every day

(b) I would say now that four months ago:
Where I work, people took shortcuts that made work less safe.

Never |————|————————————| Every day

[The mark on (a) indicates that you think this hardly ever happens now. The mark on (b) shows that you think it didn't happen very often four months ago, but it happened more often at that time than it does now.]

21. (a) At the present time:
In our company, employees feel that doing the job safely is as important as getting the job done.

Never |_____| At all times on every job

(b) I would say now that four months ago:
In our company, employees felt that doing the job safely was as important as getting the job done.

Never |_____| At all times on every job

22. (a) At the present time:
I am confident in my ability to make work as safe as possible for myself and my co-workers.

Never |_____| At all times on every job

(b) I would say now that four months ago:
I was confident in my ability to make work as safe as possible for myself and my co-workers.

Never |_____| At all times on every job

23. (a) At the present time:
I believe that hurrying to get the job done costs more in the long run.

Totally Disagree |_____| Totally Agree

(b) I would say now that four months ago:
I believed that hurrying to get the job done cost more in the long run.

Totally Disagree |_____| Totally Agree

CONSTRUCTION SAFETY SURVEY

1. What is your age?	_____ Years
2. How many years of school have you completed?	_____ Years
3. Do you have primary financial responsibility for one or more children or dependent adults?	____No (If No, skip to question 4) ____Yes (If Yes, how many?) _____Children _____Dependent Adults
4. How many years have you worked in any kind of construction? (Not just the particular job you do now.)	_____ Years
5. On average, how many months out of a year do you work in construction?	_____ Months
6. On average, how many hours per week do you work in construction?	_____ Hours per week
7. What is your position where you work? (Check the one that applies most to your usual position.)	_____Owner ____Supervisor/Foreman _____Employee
8. In your entire career in construction, how many on-the-job injuries have you had that required medical treatment or made you miss at least a day of work?	_____ Injuries (If 0, skip to question 11)
9. Were your work activities ever restricted due to one of these injuries?	____No ____Yes
10. How many on-the-job injuries did you have in the last year which have required medical treatment or made you miss at least one day of work?	_____ Injuries
11. How many times in the last year would you say written safety materials were given to employees where you work?	_____Times
12. How many times in the last year would you say meetings were held to discuss safety issues where you work?	_____Times

For the following three questions (12-14), please place a mark on the line to indicate where you would rate yourself or your company right now.

Example:

Where I work, people take shortcuts that make work less safe.

Never |_____| Every day

(The mark on the line indicates that this hardly ever happens.)

13. In our company, employees feel that doing the job safely is as important as getting the job done.

Never |_____| At all times on every job

14. I am confident in my ability to make work as safe as possible for myself and my co-workers.

Never |_____| At all times on every job

15. I believe that hurrying to get the job done costs more in the long run.

Totally Disagree |_____| Totally Agree

Please circle the number that shows how much you agree or disagree with each of the following statements.	1 = Strongly Disagree	2 = Disagree	3= Slightly Disagree	4= Slightly Agree	5 = Agree	6 = Strongly Agree
16. Back support belts are the best way to prevent back injuries.	1	2	3	4	5	6
17. Cleaning up a cluttered work site is not usually worth the time or trouble.	1	2	3	4	5	6
18. Financial pressures keep companies like ours from doing things as safely as possible.	1	2	3	4	5	6

Please circle the number that shows how much you agree or disagree with each of the following statements.	1 = Strongly Disagree	2 = Disagree	3= Slightly Disagree	4= Slightly Agree	5 = Agree	6 = Strongly Agree
19. Experienced workers have enough common sense that they never need to be reminded about how to do things safely.	1	2	3	4	5	6
20. When I see someone doing something unsafe, I feel I am able to take some action to make the situation safer.	1	2	3	4	5	6
21. Working at a steady pace is one of the best ways to keep people from getting injured on the job.	1	2	3	4	5	6
22. Working closely with an experienced worker is one of the best ways for less experienced employees to develop safe work habits.	1	2	3	4	5	6
23. Sometimes even experienced workers do not pay close enough attention to the job they are doing.	1	2	3	4	5	6
24. When I think a worksite is not safe, I feel confident that I can figure out a way to make it safer.	1	2	3	4	5	6
25. Putting up safety posters in work areas is the best way to let employees know that safety is a priority.	1	2	3	4	5	6
26. It is worth the time and trouble to make sure you have the right tools for a job before starting any task.	1	2	3	4	5	6

Please circle the number that indicates your opinion of <u>how often</u> each statement applies to you or your work.	1 = Hardly Ever	2= Not Often	3 = Fairly Often	4 = Often	5= Very Often	6 = Almost Always
27. Everyone works together as a team to make work conditions safe.	1	2	3	4	5	6
28. I take the time to plan out what is necessary to do a job safely.	1	2	3	4	5	6
29. Supervisors and employees freely share their concerns and ideas about safety on the job.	1	2	3	4	5	6
30. We work short-handed.	1	2	3	4	5	6
31. We take the time and trouble to make worksite conditions as safe as possible before starting any job.	1	2	3	4	5	6
32. Supervisory personnel communicate that keeping safe is as important as getting the job done.	1	2	3	4	5	6
33. Experienced workers take the time to show less experienced workers the safest way to get a job done.	1	2	3	4	5	6
34. I feel capable of making good decisions about what safety equipment is needed to get a job done safely.	1	2	3	4	5	6
35. Financial pressures keep me from doing things as safely as possible.	1	2	3	4	5	6

We would like you to rate each of the following statements according to **how you think that things were four months ago** at work. For each statement, please mark the line to indicate where you would now rate the way things were four months ago.

Example: I would say now that four months ago:

Where I work, people took shortcuts that made work less safe.

Never |_____| Every day

[The mark indicates that you think this didn't happen very often four months ago.]

36. **I would say now that four months ago:**
In our company, employees felt that doing the job safely was as important as getting the job done.

Never |_____| At all times on every job

37. **I would say now that four months ago:**
I was confident in my ability to make work as safe as possible for myself and my co-workers.

Never |_____| At all times on every job

38. **I would say now that four months ago:**
I believed that hurrying to get the job done cost more in the long run.

Totally Disagree |_____| Totally Agree

Your answers to the following questions will help us to do the best possible job of providing small construction companies with safety programs that are relevant to their needs and convenient to use.

39. Within the past nine months, do you recall being invited to participate in a construction safety program sponsored by Kentucky Employers Mutual Insurance and UK?

YES ☐ **NO** ☐

If your answer was **YES, PLEASE TURN TO THE NEXT PAGE.**
If your answer was **NO, STOP HERE** — Thank you very much for your responses.

40. If your answer to **question #39** was **YES**, did your company participate in the program?

YES	NO
☐	☐
If YES, please go to Question #41	If NO, please go to Question #42

41. If your answer to **question #40** was **YES**, for which of the following reasons did you decide to participate?

☐ (a) The economic incentive was adequate.

☐ (b) The time involved was reasonable for me.

☐ (c) The time involved was reasonable for my employees.

☐ (d) Safety is a priority for our company.

☐ (e) The paperwork involved was not a burden.

☐ (f) The program sounded like it would be interesting.

☐ (g) The program sounded like it would be beneficial.

☐ (h) Other (please specify)_____

Which was your most important reason for participating?

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
☐	☐	☐	☐	☐	☐	☐	☐

Thank you very much for your responses.

42. If your answer to **question #40** was **NO**, for which of the following reasons did you decide not to participate?

☐ (a) The economic incentive was inadequate.

☐ (b) The time involved was too much for me.

☐ (c) The time involved was too much for my employees.

☐ (d) Our company already has a good safety record.

☐ (e) The paperwork involved was not worth the time and trouble.

☐ (f) The program sounded like it would not be interesting.

☐ (g) The program sounded like it would not be beneficial.

☐ (h) Other (please specify)_____

Which was your most important reason for not participating?

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
☐	☐	☐	☐	☐	☐	☐	☐

Thank you very much for your responses.

Appendix H. Year 3 Surveys

Pre-Test (Green)

Immediate Post Test (Pink)

Delayed Post Test w/ Retrospective Pre-Test (White)

Control, Agree No Return and Decline (Grey)

CONSTRUCTION SAFETY PROJECT
GREEN SURVEY

№ 1743

For items 1 through 10, please indicate how often each statement applies to you or your place of work at the present time.	**1 = Almost Never**	**2= Not Often**	**3 = Fairly Often**	**4 = Often**	**5= Very Often**	**6 = Almost Always**
AT THE PRESENT TIME:						
1. Financial pressures keep me from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
2. Experienced workers in our company take time to show less experienced workers the safest way to do the job.	**1**	**2**	**3**	**4**	**5**	**6**
3. The possible financial consequences of an injury make me work as safely as I know how.	**1**	**2**	**3**	**4**	**5**	**6**
4. Where I work, we take the time and trouble to make the work site as safe as possible before starting any job.	**1**	**2**	**3**	**4**	**5**	**6**
5. We make good decisions at work about what equipment is needed to get the job done safely.	**1**	**2**	**3**	**4**	**5**	**6**
6. Supervisors and employees in our company freely share their concerns and ideas about safety on the job.	**1**	**2**	**3**	**4**	**5**	**6**
7. In our company, everyone works together as a team to make work conditions safe.	**1**	**2**	**3**	**4**	**5**	**6**
8. Supervisors in our company communicate that keeping safe is as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**
9. Financial pressures keep our company from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
10. Employees in our company feel that doing the job safely is as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**

Please tell us about yourself.

11. What is your age?	_____ Years
12. How many years of school have you completed?	_____ Years
13. Do you have primary financial responsibility for one or more children or dependent adults?	☐ No ☐ Yes
14. How many years have you worked in any kind of construction? (Not just the particular job you do now.)	_____ Years
15. How many months out of a year do you work in construction?	_____ Months
16. On average, how many hours per week do you work in construction?	_____ Hours per week
17. What is your position where you work? (Check the box that best describes your position.)	☐ Owner ☐ Supervisor/Foreman ☐ Employee
18. How long have you worked for your present company?	_____Years _____Months
19. How many times in the last year would you say written safety materials were given to employees where you work?	_____Times
20. How many times in the last year would you say meetings were held to discuss safety issues where you work?	_____Times
21. How many times in the last year have you sought work related safety information on your own?	_____Times

22. In your entire career in construction, how many on-the-job injuries have you had that required medical treatment or made you miss at least a day of work?

_____ Injuries

23. How many on-the-job injuries did you have in the last year that required medical treatment or made you miss at least one day of work?

_____ Injuries

24. On average, how often are you in a 'close call' situation for an on-the-job injury. By 'close call,' we mean any situation or event that, *in your opinion,* could easily result in an injury bad enough to miss at least one day of work.

- ☐ At least once a week
- ☐ At least twice a month
- ☐ At least once a month
- ☐ At least six times a year
- ☐ At least three times a year
- ☐ At least once a year
- ☐ Less than once a year

(Optional)

25. What is your ethnicity?

- ☐ Hispanic or Latino / Latina
- ☐ Not Hispanic or Latino / Latina

26. What is your race? (Select one or more.)

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African-American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

CONSTRUCTION SAFETY PROJECT
PINK SURVEY

№ 1743

For items 1 through 10, please indicate how often each statement applies to you or your place of work at the present time.	**1 = Almost Never**	**2= Not Often**	**3 = Fairly Often**	**4 = Often**	**5= Very Often**	**6 = Almost Always**
AT THE PRESENT TIME:						
1. Financial pressures keep me from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
2. Experienced workers in our company take time to show less experienced workers the safest way to do the job.	**1**	**2**	**3**	**4**	**5**	**6**
3. The possible financial consequences of an injury make me work as safely as I know how.	**1**	**2**	**3**	**4**	**5**	**6**
4. Where I work, we take the time and trouble to make the work site as safe as possible before starting any job.	**1**	**2**	**3**	**4**	**5**	**6**
5. We make good decisions at work about what equipment is needed to get the job done safely.	**1**	**2**	**3**	**4**	**5**	**6**
6. Supervisors and employees in our company freely share their concerns and ideas about safety on the job.	**1**	**2**	**3**	**4**	**5**	**6**
7. In our company, everyone works together as a team to make work conditions safe.	**1**	**2**	**3**	**4**	**5**	**6**
8. Supervisors in our company communicate that keeping safe is as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**
9. Financial pressures keep our company from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
10. Employees in our company feel that doing the job safely is as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**

11. On average, how often are you in a 'close call' situation for an on-the-job injury. By 'close call,' we mean any situation or event that, *in your opinion,* could easily result in an injury bad enough to miss at least one day of work.

- ☐ At least once a week
- ☐ At least twice a month
- ☐ At least once a month
- ☐ At least six times a year
- ☐ At least three times a year
- ☐ At least once a year
- ☐ Less than once a year

12. For which of the following reasons did you decide to participate in this project? (Check all that apply)

- ☐ (a) Our company will get an insurance discount.
- ☐ (b) I wanted to learn more about safety.
- ☐ (c) The time involved was reasonable.
- ☐ (d) Safety is a priority for our company.
- ☐ (e) The paperwork involved was not a burden.
- ☐ (f) The program sounded interesting.
- ☐ (g) The program sounded worthwhile.
- ☐ (h) My boss asked me to.
- ☐ (i) Other (please specify)_____.

Which was your most important reason for participating? (Choose one)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
☐	☐	☐	☐	☐	☐	☐	☐	☐

№ 1743

Name ☐Mr. ☐Ms. _____

Address _____

City _____ State _____ Zip code _____

Phone number (_____) _____ - _____

PLEASE FILL OUT AND RETURN WITH OTHER MATERIALS.

CONSTRUCTION SAFETY PROJECT:
Follow-Up Survey

№ 1743

For items 1 through 10, please indicate how often each statement applies to you or your place of work at the present time.	**1 = Almost Never**	**2= Not Often**	**3 = Fairly Often**	**4 = Often**	**5= Very Often**	**6 = Almost Always**
AT THE PRESENT TIME:						
1. Financial pressures keep me from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
2. Experienced workers in our company take time to show less experienced workers the safest way to do the job.	**1**	**2**	**3**	**4**	**5**	**6**
3. The possible financial consequences of an injury make me work as safely as I know how.	**1**	**2**	**3**	**4**	**5**	**6**
4. Where I work, we take the time and trouble to make the work site as safe as possible before starting any job.	**1**	**2**	**3**	**4**	**5**	**6**
5. We make good decisions at work about what equipment is needed to get the job done safely.	**1**	**2**	**3**	**4**	**5**	**6**
6. Supervisors and employees in our company freely share their concerns and ideas about safety on the job.	**1**	**2**	**3**	**4**	**5**	**6**
7. In our company, everyone works together as a team to make work conditions safe.	**1**	**2**	**3**	**4**	**5**	**6**
8. Supervisors in our company communicate that keeping safe is as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**
9. Financial pressures keep our company from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
10. Employees in our company feel that doing the job safely is as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**

Please think back to the way things were in your work four months ago. For statements 11 through 20, please rate how you *would have answered* four months ago, if you saw things then the way you do now.

For items 11 through 20, please indicate how you think you would have answered 4 months ago if you saw things then the way you do now.	**1 = Almost Never**	**2= Not Often**	**3 = Fairly Often**	**4 = Often**	**5= Very Often**	**6 = Almost Always**
FOUR MONTHS AGO:						
11. Financial pressures kept me from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
12. Experienced workers in our company took time to show less experienced workers the safest way to do the job.	**1**	**2**	**3**	**4**	**5**	**6**
13. The possible financial consequences of an injury made me work as safely as I knew how.	**1**	**2**	**3**	**4**	**5**	**6**
14. Where I work, we took the time and trouble to make the work site as safe as possible before starting any job.	**1**	**2**	**3**	**4**	**5**	**6**
15. We made good decisions at work about what equipment was needed to get the job done safely.	**1**	**2**	**3**	**4**	**5**	**6**
16. Supervisors and employees in our company freely shared their concerns and ideas about safety on the job.	**1**	**2**	**3**	**4**	**5**	**6**
17. In our company, everyone worked together as a team to make work conditions safe.	**1**	**2**	**3**	**4**	**5**	**6**
18. Supervisors in our company communicated that keeping safe was as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**
19. Financial pressures kept our company from doing things as safely as possible.	**1**	**2**	**3**	**4**	**5**	**6**
20. Employees in our company felt that doing the job safely was as important as getting the job done.	**1**	**2**	**3**	**4**	**5**	**6**

21. Are you currently employed by the company that you worked for four months ago? **YES** ☐ **NO** ☐

22. On average, how often are you in a 'close call' situation for an on-the-job injury. By 'close call,' we mean any situation or event that, *in your opinion,* could easily result in an injury bad enough to miss at least one day of work.

- ☐ At least once a week
- ☐ At least twice a month
- ☐ At least once a month
- ☐ At least six times a year
- ☐ At least three times a year
- ☐ At least once a year
- ☐ Less than once a year

CONSTRUCTION SAFETY SURVEY

For items 1 through 10, please indicate how often each statement applies to you or your place of work at the present time.	1 = Almost Never	2= Not Often	3 = Fairly Often	4 = Often	5= Very Often	6 = Almost Always
AT THE PRESENT TIME:						
1. Financial pressures keep me from doing things as safely as possible.	1	2	3	4	5	6
2. Experienced workers in our company take time to show less experienced workers the safest way to do the job.	1	2	3	4	5	6
3. The possible financial consequences of an injury make me work as safely as I know how.	1	2	3	4	5	6
4. Where I work, we take the time and trouble to make the work site as safe as possible before starting any job.	1	2	3	4	5	6
5. We make good decisions at work about what equipment is needed to get the job done safely.	1	2	3	4	5	6
6. Supervisors and employees in our company freely share their concerns and ideas about safety on the job.	1	2	3	4	5	6
7. In our company, everyone works together as a team to make work conditions safe.	1	2	3	4	5	6
8. Supervisors in our company communicate that keeping safe is as important as getting the job done.	1	2	3	4	5	6
9. Financial pressures keep our company from doing things as safely as possible.	1	2	3	4	5	6
10. Employees in our company feel that doing the job safely is as important as getting the job done.	1	2	3	4	5	6

Please think back to the way things were in your work four months ago. For statements 11 through 20, please rate how you *would have answered* four months ago, if you saw things then the way you do now.

For items 11 through 20, please indicate how you think you would have answered 4 months ago if you saw things then the way you do now.	**1 = Almost Never**	**2= Not Often**	**3 = Fairly Often**	**4 = Often**	**5= Very Often**	**6 = Almost Always**
FOUR MONTHS AGO:						
11. Financial pressures kept me from doing things as safely as possible.	1	2	3	4	5	6
12. Experienced workers in our company took time to show less experienced workers the safest way to do the job.	1	2	3	4	5	6
13. The possible financial consequences of an injury made me work as safely as I knew how.	1	2	3	4	5	6
14. Where I work, we took the time and trouble to make the work site as safe as possible before starting any job.	1	2	3	4	5	6
15. We made good decisions at work about what equipment was needed to get the job done safely.	1	2	3	4	5	6
16. Supervisors and employees in our company freely shared their concerns and ideas about safety on the job.	1	2	3	4	5	6
17. In our company, everyone worked together as a team to make work conditions safe.	1	2	3	4	5	6
18. Supervisors in our company communicated that keeping safe was as important as getting the job done.	1	2	3	4	5	6
19. Financial pressures kept our company from doing things as safely as possible.	1	2	3	4	5	6
20. Employees in our company felt that doing the job safely was as important as getting the job done.	1	2	3	4	5	6

Please tell us about yourself.

21. What is your age? _____ Years

22. How many years of school have you completed? _____ Years

23. Do you have primary financial responsibility for one or more children or dependent adults? ☐ No ☐ Yes

24. How many years have you worked in any kind of construction? (Not just the particular job you do now.) _____ Years

25. How many months out of a year do you work in construction? _____ Months

26. On average, how many hours per week do you work in construction? _____ Hours per week

27. What is your position where you work? (Check the box that best describes your position.) ☐ Owner ☐ Supervisor/Foreman ☐ Employee

28. How long have you worked for your present company? _____ Years _____ Months

29. How many times in the last year would you say written safety materials were given to employees where you work? _____ Times

30. How many times in the last year would you say meetings were held to discuss safety issues where you work? _____ Times

31. How many times in the last year have you sought work related safety information on your own? _____ Times

32. In your entire career in construction, how many on-the-job injuries have you had that required medical treatment or made you miss at least a day of work?

_____ Injuries

33. How many on-the-job injuries did you have in the last year that required medical treatment or made you miss at least one day of work?

_____ Injuries

34. On average, how often are you in a 'close call' situation for an on-the-job injury. By 'close call,' we mean any situation or event that, *in your opinion,* could easily result in an injury bad enough to miss at least one day of work.

- ☐ At least once a week
- ☐ At least twice a month
- ☐ At least once a month
- ☐ At least six times a year
- ☐ At least three times a year
- ☐ At least once a year
- ☐ Less than once a year

(Optional)

35. What is your ethnicity?

- ☐ Hispanic or Latino / Latina
- ☐ Not Hispanic or Latino / Latina

36. What is your race? (Select one or more.)

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African-American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

Your answers to the following questions will help us to do the best possible job of providing small construction companies with safety programs that are relevant to their needs and convenient to use.

37. Within the past six months, do you recall being invited to participate in a construction safety program sponsored by Kentucky Employers Mutual Insurance and University of Kentucky?

YES ☐ **NO** ☐

If your answer was **YES, PLEASE TURN TO THE NEXT PAGE.**
If your answer was **NO, STOP HERE** — Thank you very much for your responses.

38. If your answer to **question #37** was **YES**, did your company participate in the program?

YES	NO
☐	☐
If YES, please go to Question #39	If NO, please go to Question #40

39. If your answer to **question #38** was **YES**, for which of the following reasons did you decide to participate? (Check all that apply)

☐ (a) The economic incentive was adequate.

☐ (b) The time involved was reasonable for me.

☐ (c) The time involved was reasonable for my employees.

☐ (d) Safety is a priority for our company.

☐ (e) The paperwork involved was not a burden.

☐ (f) The program sounded like it would be interesting.

☐ (g) The program sounded like it would be beneficial.

☐ (h) Other (please specify)_____.

Which was your most important reason for participating? (Choose one)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
☐	☐	☐	☐	☐	☐	☐	☐

Thank you very much for your responses.

40. If your answer to **question #38** was **NO**, for which of the following reasons did you decide not to participate? (Check all that apply)

☐ (a) The economic incentive was inadequate.

☐ (b) The time involved was too much for me.

☐ (c) The time involved was too much for my employees.

☐ (d) Our company already has a good safety record.

☐ (e) The paperwork involved was not worth the time and trouble.

☐ (f) The program sounded like it would not be interesting.

☐ (g) The program sounded like it would not be beneficial.

☐ (h) Other (please specify)_____.

Which was your most important reason for not participating? (Choose one)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
☐	☐	☐	☐	☐	☐	☐	☐

Thank you very much for your responses.

Appendix I. Safety Climate Tool

Safety Climate Scale

For items 1 through 10, please indicate how often each statement applies to you or your place of work at the present time.	1 = Almost Never	2= Not Often	3 = Fairly Often	4 = Often	5= Very Often	6 = Almost Always
AT THE PRESENT TIME:						
1. Financial pressures keep me from doing things as safely as possible.	1	2	3	4	5	6
2. Experienced workers in our company take time to show less experienced workers the safest way to do the job.	1	2	3	4	5	6
3. The possible financial consequences of an injury make me work as safely as I know how.	1	2	3	4	5	6
4. Where I work, we take the time and trouble to make the work site as safe as possible before starting any job.	1	2	3	4	5	6
5. We make good decisions at work about what equipment is needed to get the job done safely.	1	2	3	4	5	6
6. Supervisors and employees in our company freely share their concerns and ideas about safety on the job.	1	2	3	4	5	6
7. In our company, everyone works together as a team to make work conditions safe.	1	2	3	4	5	6
8. Supervisors in our company communicate that keeping safe is as important as getting the job done.	1	2	3	4	5	6
9. Financial pressures keep our company from doing things as safely as possible.	1	2	3	4	5	6
10. Employees in our company feel that doing the job safely is as important as getting the job done.	1	2	3	4	5	6

Appendix J. Web simulation

Bob's Builders

UK Lessons

Kentucky Injury Prevention and Research Center

KIPRC

Construction-related Training Exercises

Credits	Developers of these exercises
Overall Purpose	The purpose of these exercises
About the exercises	Information about the exercises.
Instructions	Instructions on how operate the exercises.
Suggestions	Provide suggestions for developing future lessons

Lesson Name (click to start)	Purpose
Bob's Builders 	This story is about the pressures of working short-handed on a job that is behind schedule. In working through the story, you will experience the decisions the characters make about the pace of work, the importance of good body mechanics, and how to coach a relatively inexperienced worker to get the job done safely.
Rogers' Remodelers 	This story illustrates how a cluttered worksite can hamper productivity, and how clear communication is essential when site conditions are such that things aren't going according to plan.
Smitty's Drywall 	This story shows how fatigue, poor planning, clutter, hurrying, and improper lifting can lead to a back injury.
Off to a Late Start 	In this story, emphasis is on organizing work assignments when key workers are late or do not show up for work. Problems include how to coach less experienced workers and checking equipment set up.
The Deck Dilemma 	[ready for review] In this story, a worker decides how to cope with cluttered worksite conditions created by other subcontractors. Site conditions are sloppy due to bad weather. The story illustrates how responding to these conditions with only halfway measures may compromise safety and lead to an injury.
Up on the Roof 	[ready for review] This story has to do with planning a job out, fall protection, and determining who has sufficient experience to perform a potentially hazardous task.

UK Lessons Credits KIPRC

Pamela Kidd	Occupational Injury Prevention Program Kentucky Injury Prevention and Research Center
Tim Struttmann	Kentucky Cabinet for Health Services Department for Public Health
Jonathan Mays	and
Mark Parshall	University of Kentucky Chandler Medical Center
Susan Wojcik	Lexington, Kentucky

----- Internet Training Documents by -----

Steve Bayer Digital Communications Systems [www.steve-o.com]

Babs DeArmond Graphic Design

Joe Hoffecker, Illustrator [Joe Hoffecker]

[Back to the main page]

UK Lessons

Overall Purpose

KIPRC

This safety training program consists of a series of stories based on real-life situations described by construction workers in a variety of trades.

The purpose is to tell a story in a way that lets you experience some of the decisions the characters have to make in situations where an injury could occur.

The exercises also include information about economic, productivity, and health issues that individuals and companies face when an injury occurs. We hope that you will find the problems and situations in the stories relevant to your work, and that working through these stories will help you perform your job safely.

[Back to the main page]

UK Lessons About the Exercises KIPRE

The exercises have six basic featuress:

1. audio narration
2. story pages
3. question pages
4. feeback pages
5. evaluation form.

(1) Audio Narration

Nearly all information found in the lessons is narrated. To hear the narration, click the small loudspeaker icon that looks like this:

On the question pages and the feedback pages, considerable information is presented. To avoid the long download times and having to listen to the entire page of information, the loudspeaker icon is located at the end of questions and sections. This allows the user to select only sections of interest.

The audio is in a "Real Audio" format, compatible with recent versions of Netscape and Microsoft Internet Explorer. For older browsers, you might have to download and install the latest version of "RealPlayer G-2" program from www.real.com. If your current system is compatible, the audio files will download into your browser and automatically play.

Click here for additional notes concerning installing and using "RealPlayer" on your computer system.

(2) The Story Pages

These lessons are presented as stories. Each lesson's story discusses a company, people, and circumstances relating to company's activities.

Occasionally, the story is interrupted with questions covering whatever is going happening up to that point in the story.

Except for the last set of questions, the story provides new developments after you work the questions and read your feedback information (described below).

(3) The Question Pages:

Each question page presents a single question - such as "What should Paul do now?"

Under the questions, possibilities are presented - such as "Paul should stop working and untangle the cord." Under each possibility, there are Agree and Disagree buttons that look like this:

○ Agree ○ Disagree

Choose one by clicking inside the circle:

◉ Agree ○ Disagree **or** ○ Agree ◉ Disagree

Make sure you have clicked Agree or Disagree for each item. When you've completed your choices, click the "Submit" button at the bottom of the page. It looks like this:

You will then be taken to the "Feedback page".

(4) The Feedback Pages

When your choices are submitted, the computer scores your results and provides you with information on a "Feedback" page.

The feedback page shows the question, the possibilities, how you scored on the items, and provides explanations covering the individual possibilities.

Spend some time examining this feedback information. It will help you answer other questions as you progress through the story.

(5) The Evaluation Form

The developers would like to know how you feel about this training product. An Evaluation Form is linked to the last page of each lesson.

Please spend a few minutes rating the Evaluation Form's fifteen items. Your ratings are important. They will be used to improve these lessons and for guidance when developing future lessons.

[Back to the main page]

UK Lessons Instructions KIPRC

Unless you wish to type in comments on some pages, all you need to do to operate these lesson is point and click on words, pictures, and circles. Most of these objects are called "links".

Links lead you through each lesson. It was the underlined word "Instructions" that "linked" you to this information and brought you to this page. Likewise, there are links for each lesson - such as for Bob's Builders.

From the main "Lessons" page, if you click on underlined words or the picture beneath them, you will be taken to the lesson you chose.

Each lesson consists of many different "pages". On the pages that tell the story, the word "Next" will be underlined. It looks like this:

Next

This "next link" will take you to the next page of information.

At the top left corner of most pages is a picture that looks like this:

If click this "logo link", it will take you back to the main "Lessons" page that takes you to the different lessons. This link is useful if you want to jump out of a lesson and go to some other lesson.

There a small loudspeaker link on nearly all of the pages. It looks like this:

If you click it and your computer is capable of playing "RealAudio", the information near the loudspeaker will be read to you.

On the "story pages", you will only notice one loudspeaker link. It will read all of the story on that page. On the more complicated pages - such as the question and feedback pages - you will find frequent loudspeaker links.

By using them, you can select the smaller portions that you're interested in. This way, you do not have to "sit through" a reading of all the information (this would require a long time for the audio to come into your computer and be read).

One other picture link is at the bottom of "Question Pages", "Comment Forms", and "Evaluation Forms". It is called the "Submit button" and it looks like this:

This button is clicked when you have answered all the questions or made your comments. It sends your question information to the computer system for scoring or e-mails your comments to the developer, depending on which

page you're on.

An occasional text link might be found at the bottom of the Feedback Pages. It could look like this:

> **You may want to go back, review the information in this section, and re-think your choices. Click here to re-examine this section.**

This message and link are provided when you miss two or more of the items. If you click the underlined words, you will be taken back to the beginning of the section that relates to the specific questions you answered. Then, you may re-do the questions.

This link is optional - you may click the Next link and continue with the lesson, ignoring the suggestion. However, the developers recommend you follow the link and re-examine that section.

The "Back" and "Forward" Buttons are the top of your Internet browser. They might look like this:

 or

The one pointing left - the Back button, takes you backward in the lesson. The one pointing right - the Forward button - brings you forward to where you left off.

The Question Pages present a single question - such as "What should Paul do now?" Under the questions, possibilities are presented - such as "Paul should stop working and untangle the cord."

Under each possibility, there are Agree and Disagree buttons that look like this:

○ Agree ○ Disagree

Choose one by clicking inside the circle:

◉ Agree ○ Disagree

or

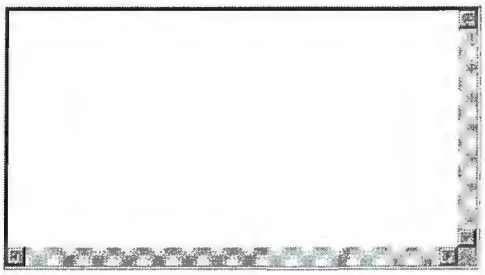
○ Agree ◉ Disagree

Make sure you have clicked Agree or Disagree for each item. When you've completed your choices, click the "Submit" button at the bottom of the page. It looks like this:

A link to a **Comments Form** can be found at the bottom of each question's Feedback Page. This allows you to comment on the issues, answers, or scoring relating to that specific feedback page. It looks like this:

Email a comment

This link takes you to a page with a text box that looks like this:



Just click the cursor inside the box and type your comment. When you're finished, click the Submit button at the bottom of the page. You will be taken to another page indicating if the information was sent or if you forgot to click something. **If the comment relates to a particular question, please include the question number.**

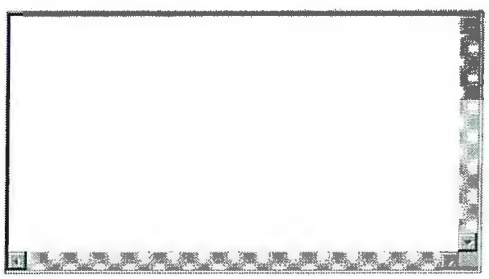
An **Evaluation Form** is the last page of each lesson. The form operates like the question pages. An example looks like this:

1) **The story was easy to read.**

- O strongly disagree
- O disagree
- O agree
- O strongly agree

Item 16, on the Evaluation Form, is a comments box where you can type in additional comments. It looks like this:

16) If you have any general comments or suggestions, please type them in the box below:



Just click the cursor inside the box and type your comment.

Additional instructions and reminders will be found on pages such as the Evaluation and Feedback-comments forms. You may now click Next to return to the main Lessons page.

Next

UK Lessons

Suggestions

KIPRC

This form surveys your opinion about future lessons and inquires if you would be interested in evaluating future products. Type your name and e-mail address in the boxes below. Then, respond to the questions and type in any comments. When you are finished, click the Submit button at the bottom of the page to e-mail your information to the lesson developers. Thank you for supplying this information.

Name

Return E-mail address

(1) Indicate, by clicking the circles next to yes or no, whether or not you would like the developers to design additional training materials similar to these construction lessons.

○ Yes ○ No

(2) Indicate whether or not you would be interested in helping the Kentucky Injury Prevention and Research Center (KIPRC) evaluate similar lessons to be developed in the future.

○ Yes ○ No

Below, if you answered Yes to item (1), indicate lessons you would like KIPRC to develop. Click the cursor in the box and type your information. Be as specific as possible.

When you are finished, click the Submit button to send your opinions to the developers. Thank you!

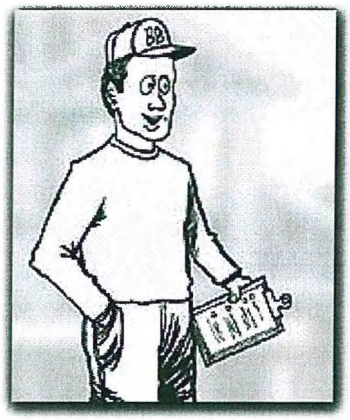
Submit

UK Lessons

Bob's Builders

KIPRC

Bob started his block and foundation business as a way of having better control over his work.



To start up his company he took out a $30,000 loan to purchase a truck, cement mixer, and scaffolding.

His monthly loan payment is $500.

He works out of his home but dreams of eventually having an office and expanding his operation to run two or three crews.

[next]

Bob's Builders

However, Bob has lost three employees in the last two weeks.

Two brothers who worked for him since he went into business quit to start their own company.

They were his most experienced workers.

The third employee, who had only been working for him for six months left last week for an extra dollar an hour with another company.

[next]

Bob's Builders

Bob hasn't found a replacement for any of them yet.

He's still hoping to find someone experienced, but would be willing to hire and train a less experienced worker if he can find someone he thinks will stay.

Right now, his only employee is Fred.

[next]

UK Lessons

Bob's Builders

KIPRC

Fred has only been working for Bob for two months. Up until now he has just mixed and packed mortar.

Fred makes $8.00/hour. He is single, lives with his parents and has a $180/month truck payment. He is sober, dependable, shows up on time, and does what he's told.

Fred knows Bob wants to expand the business eventually. He always tries to show Bob that he's loyal and a hard-worker because he'd like to be a crew leader after learning the trade.

[next]

UK Lessons

Bob's Builders

KIPRC

They are working in a subdivision with 30 new home sites.

There are five footers already poured awaiting block.

The houses are on crawl space foundations.

The block, sand, and concrete were delivered to the job site two days ago.

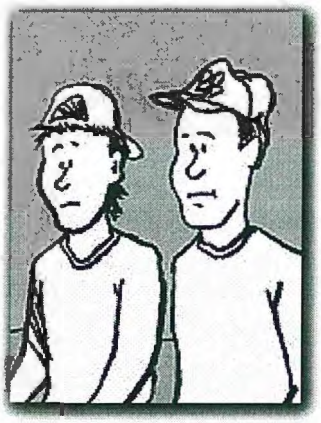
[next]

UK Lessons

Bob's Builders

KIPRC

Losing 3 workers in such a short time has really caused some problems keeping up with jobs that had already been bid.



They are just starting this job after finishing another contract where they ran two days behind due to the employees leaving. Right now, it is just Bob and Fred.

Until the two brothers left, Bob hadn't been very involved in training Fred. He buddied him up with the brothers, and they seemed to feel that he was coming along OK. At least until he can get some more help, Bob really needs to depend on Fred.

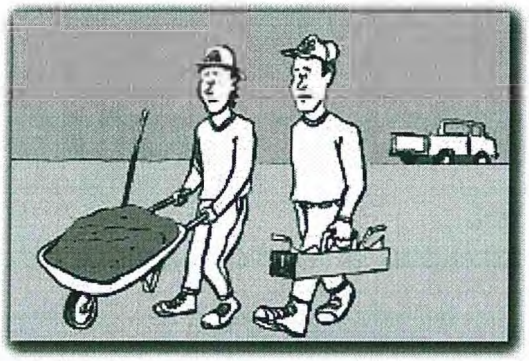
[next]

UK Lessons

Bob's Builders

KIPRC

Bob and Fred arrive at the site and get set up.



Bob hopes he won't have to deal with the general contractor today.

He told the general contractor a couple of days ago that he would be starting the job later than originally planned.

The general contractor let him know that he was unhappy with the delay.

[next]

UK Lessons

Bob's Builders

KIPRC

It's Friday afternoon. Bob thinks they can get caught up if they work the weekend.

He tells Fred that they must work Saturday. Fred had planned on going fishing this weekend after cashing his check. He knows Bob is in a bind, and agrees to work Saturday. He thinks that maybe if he really hustles today they may not have to work all day Saturday and he may be able to get some fishing in afterwards.

[next]

About this time, the general contractor pulls up.

The general contractor says to Bob, "Hey! We are way behind, you gotta pick it up or I'll find someone else to lay this block."

Fred senses the pressure Bob is under and he wants to do what he can to help. He begins by mixing the mortar and moving blocks faster than usual. Meanwhile Bob is laying the first row.

[next]

UK Lessons **Bob's Builders** KIPRC

Fred's rushing is causing problems.

He has broken seven blocks in the first hour. Pieces of block are scattered on the ground. He is not lifting properly and he is being careless in handling materials. Bob becomes upset when he notices all of the broken block.

He sees Fred bending and twisting to throw the block. Bob has had a back injury in the past and he still has some lower back pain. Since that time he has learned proper ways to lift and handle materials.

[next]

UK Lessons

Bob's Builders

KIPRC

What would be some good ways for Bob to deal with the situation?

(For each, click Agree or Disagree to express your opinion. You may change your answers at any time. However, when you've completed your decisions, click submit to see how you scored.)

1. **Holler to Fred, "Slow down, you're breaking too many blocks."**

○ Agree ○ Disagree

2. **Stop work to tell Fred: "I want you to clean up the broken blocks and slow down some. Broken blocks cost me, and you can trip or twist your ankle on them."**

○ Agree ○ Disagree

3. **Tell Fred, "That's how I hurt my back. If you keep lifting like that you are going to hurt your back, and I can't afford to lose you."**

○ Agree ○ Disagree

4. **Tell Fred, "Keep up this pace and maybe you'll get to go fishing tomorrow after all."**

○ Agree ○ Disagree

Submit When you finish, click submit to see how you scored.

What would be some good ways for Bob to deal with the situation?

---

1. **Holler to Fred, "Slow down, you're breaking too many blocks."**

◉ Agree ○ Disagree

Incorrect. Although the pressure is on and the broken blocks are costing Bob money, an injury will cost Bob more money in the long run. Plus yelling at Fred may cost Bob another worker.

---

2. **Stop work to tell Fred: "I want you to clean up the broken blocks and slow down some. Broken blocks cost me, and you can trip or twist your ankle on them."**

◉ Agree ○ Disagree

Correct! Telling Fred to slow down and clean up is important, but explaining why it is important may be more effective than just telling him.

---

3. **Tell Fred, "That's how I hurt my back. If you keep lifting like that you are going to hurt your back, and I can't afford to lose you."**

◉ Agree ○ Disagree

Correct! Bob has identified an injury risk and expressed concern for Fred as a co-worker. Using personal experiences can drive home safety messages.

---

4. **Tell Fred, "Keep up this pace and maybe you'll get to go fishing tomorrow after all."**

◉ Agree ○ Disagree

Incorrect. Both Bob and Fred have their reasons for wanting to get this job done, but rushing wastes materials and increases the chance of an injury. If Fred gets hurt, he may not be able to go fishing.

You may want to go back, review the information in this section, and re-think your choices. Click here to re-examine this section.

[next]

Email a comment

UK Lessons

Comment on 1 - 4

KIPRC

Below, you may comment on issues 1 through 4 of Bob's Builders. Just click the cursor inside the box and then type your comment. **Please type the number of the question before the comment.**

Submit

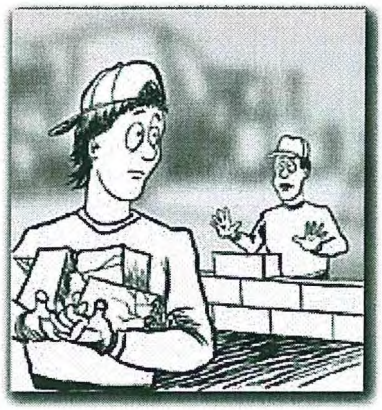
When you are finished, click the Submit button to send your opinions to the developers. Thank you!

UK Lessons

Bob's Builders

KIPRC

Bob tells Fred to slow down and clean up the broken block, but continues to lay block as Fred is clearing out the broken pieces.



Bob is thinking about how he's going to meet the contract deadline. He'd like to find some extra help, but so far the only people interested have been folks he didn't think would be dependable or have any sense.

Fred has cleaned up the work site. He has slowed down a little due to Bob's warning but he continues to twist as he throws the block.

[next]

UK Lessons

Bob's Builders

KIPRC

What should Bob do now?

(For each, click Agree or Disagree to express your opinion. You may change your answers at any time. However, when you've completed your decisions, click submit to see how you scored.)

5. **Let Fred learn his lesson the hard way. If he has some soreness after getting warned, next time he'll know enough to listen better.**

○ Agree ○ Disagree

6. **Ignore Fred's twisting. He's young and can get away with it without getting hurt.**

○ Agree ○ Disagree

7. **Stop laying block to show Fred how to throw the blocks properly without breaking them or hurting his back.**

○ Agree ○ Disagree

8. **Ignore Fred's twisting because he did slow down, which means he will be lifting less weight over a given time.**

○ Agree ○ Disagree

9. **Remind Fred again to stop lifting like that.**

○ Agree ○ Disagree

Submit When you finish, click submit to see how you scored.

UK Lessons **Bob's Builders** KIPRC

What Should Bob Do Now?

#5: **Let Fred learn his lesson the hard way. If he has some soreness after getting warned, next time he'll know enough to listen better.**

● Agree ○ Disagree

Incorrect. That could be an expensive lesson for both Fred and Bob. Bob is assuming Fred knows the correct way to throw block.

#6: **Ignore Fred's twisting. He's young and can get away with it without getting hurt.**

● Agree ○ Disagree

Incorrect. Back injuries affect construction workers of all ages. Construction workers tend to have over-developed arms and shoulder muscles and under-developed abdomen and back muscles. This means back injuries can happen even to a strong young worker.

#7: **Stop laying block to show Fred how to throw the blocks properly without breaking them or hurting his back.**

✓ Agree ○ Disagree

Correct! Although this will take about five minutes, it could prevent a painful injury for Fred who is Bob's only help right now. Bob can't afford to lose him.

#8: **Ignore Fred's twisting because he did slow down, which means he will be lifting less weight over a given time.**

● Agree ○ Disagree

Incorrect. Pacing work does help prevent back injuries but only if proper lifting technique is used.

#9: **Remind Fred again to stop lifting like that.**

● Agree ○ Disagree

Incorrect. Bob already tried a verbal reminder, but Fred is still lifting improperly. There is no reason to believe that a second reminder will be any more effective.

You may want to go back, review the information in this section, and re-think your choices. Click here to re-examine this section.

[next]

Email a comment

UK Lessons

Bob's Builders

KIPRC

It is Saturday morning. Bob is already at the work site when he receives a call from Fred on his cellular phone.

Fred tells him, "Boss, I hurt my back. I thought I felt something pull yesterday near the end of the day. But I thought it would wear off after my shower. Now I can hardly get out of bed."

Bob tells Fred to go get his back checked out. In the meantime, Bob calls his insurance agent and lets him know that he may have a claim.

[next]

UK Lessons

Bob's Builders

KIPRC

Fred finds out that he has a lower back muscle strain.

He is given a prescription for pain medicine, and told to do no heavy lifting for a week.

He can return to light duty after one week.

[next]

UK Lessons **Bob's Builders** KIPRC

How might this injury affect Fred in the short or long run?

(For each, click Agree or Disagree to express your opinion. You may change your answers at any time. However, when you've completed your decisions, click submit to see how you scored.)

10. **Fred may have to deal with Bob feeling suspicious that Fred was just trying to get out of working the weekend.**

○ Agree ○ Disagree

11. **Fred will have some financial losses.**

○ Agree ○ Disagree

12. **Fred may not be able to do this type of work anymore.**

○ Agree ○ Disagree

13. **Fred may get viewed as injury-prone and be denied workers' compensation.**

○ Agree ○ Disagree

14. **There may be no light duty, so Fred may be off duty even longer than a week.**

○ Agree ○ Disagree

15. **Even if Fred does return to work in one to two weeks, his risk of further injury or re-injury is increased.**

○ Agree ○ Disagree

16. **Fred may get addicted to pain medication.**

○ Agree ○ Disagree

Submit When you finish, click submit to see how you scored.

How might this injury affect Fred in the short or long run?

#10: **Fred may have to deal with Bob feeling suspicious that Fred was just trying to get out of working the weekend.**

(•) Agree ( ) Disagree

Correct! Some back injuries do not show up on x-rays or other medical tests. Therefore, others may doubt that the injury is real.

#11: **Fred will have some financial losses.**

(•) Agree ( ) Disagree

Correct! Workers' compensation payments can't begin until someone has been off work for 7 working days, and even then only covers two thirds of average weekly wages. In addition, he will have to pay for any medications and get reimbursed later.

#12: **Fred may not be able to do this type of work anymore.**

(•) Agree ( ) Disagree

Correct! In a recent study of work-related back injuries, 7 percent resulted in the kinds of chronic disability or disk injury that might prevent heavy work in the future.

#13: **Fred may get viewed as injury-prone and be denied workers' compensation.**

(•) Agree ( ) Disagree

Incorrect. Coverage cannot be denied simply for submitting a legitimate claim.

#14: **There may be no light duty, so Fred may be off duty even longer than a week.**

(•) Agree ( ) Disagree

Correct! Block laying is heavy work, and Bob's company is so small, there may not be any light duty to offer Fred.

#15: **Even if Fred does return to work in one to two weeks, his risk of further injury or re-injury is increased.**

(•) Agree ( ) Disagree

Correct! Nearly 20 percent of workers with an occupational back injury relapse and lose additional time within six months of the initial return to work. The risk of relapse or re-injury is 3 times greater than the risk of a back injury for someone who has never had one.

#16: **Fred may get addicted to pain medication.**

(•) Agree ( ) Disagree

Incorrect. This is not likely if the pain medication is prescribed and taken under proper medical supervision.

You may want to go back, review the information in this section, and re-think your choices. Click here to re-examine this section.

[next]

Email a comment

UK Lessons

Bob's Builders

KIPRC

Although Fred is a good worker, the thought did cross Bob's mind that he was just trying to get out of working the weekend.

However, once Fred was diagnosed with a low back injury, Bob recalled how Fred had been twisting with his lifting, and he believed Fred's injury was legitimate.

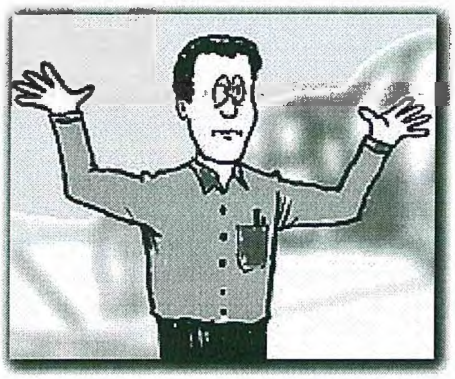
[next]

UK Lessons

Bob's Builders

KIPRC

The whole situation has put Bob in a real bind.



The job was already behind schedule, and now he will have to hire and train someone else while Fred is on the mend. Bob asks the general contractor for a little more time.

The general contractor says, "Forget it. I don't have time for you to hire and train a new crew. I'm going to get someone else to finish the job."

[next]

UK Lessons **Bob's Builders** KIPRC

How might Fred's injury affect Bob's business?

(For each, click Agree or Disagree to express your opinion. You may change your answers at any time. However, when you've completed your decisions, click submit to see how you scored.)

17. **The reputation of Bob's Builders may suffer.**

○ Agree ○ Disagree

18. **Bob may lose his business and have to go to work for someone else.**

○ Agree ○ Disagree

19. **Bob's insurance premiums are sure to go up.**

○ Agree ○ Disagree

20. **Bob will have the added cost of replacing Fred and training the replacement.**

○ Agree ○ Disagree

Submit When you finish, click submit to see how you scored.

UK Lessons **Bob's Builders** KIPRC

How might Fred's injury affect Bob's business?

---

17. **The reputation of Bob's Builders may suffer.**

◉ Agree ○ Disagree

Correct! Word of mouth about quality and reliability can make or break a small construction outfit.

---

18. **Bob may lose his business and have to go to work for someone else.**

◉ Agree ○ Disagree

Correct! He's already lost this contract. If he doesn't get some decent help quickly, he may lose his business and the independence that he worked so hard to get.

---

19. **Bob's insurance premiums are sure to go up.**

◉ Agree ○ Disagree

Incorrect. Although it is possible that his rates may go up, it is not certain that they will. Premiums are determined by the number of claims and their size.

---

20. **Bob will have the added cost of replacing Fred and training the replacement.**

◉ Agree ○ Disagree

Correct! If Bob is lucky, he will find good help quickly allowing him to meet deadlines safely. But good help is very hard to find.

Not bad! Keep up the good work.

[next]

Email a comment

What could Bob and Fred have done to prevent the injury from occurring, or what could they do to keep a similar injury from happening in the future?

(For each, click Agree or Disagree to express your opinion. You may change your answers at any time. However, when you've completed your decisions, click submit to see how you scored.)

21. **Fred could have asked Bob to show him how to throw the blocks properly.**

○ Agree ○ Disagree

22. **In the future, Bob could demonstrate materials-handling and safe lifting to all new and inexperienced workers.**

○ Agree ○ Disagree

23. **Bob could have made Fred wear a back support belt.**

○ Agree ○ Disagree

24. **Fred could tell any new help about how his injury happened, and how pacing work and lifting properly can protect them.**

○ Agree ○ Disagree

25. **When time pressure is on, Bob could remind his employees that doing things safely is still a priority because it will help everyone stay injury-free so they can get a full week's pay for a full week's work.**

○ Agree ○ Disagree

26. **As soon as Bob realized how short-handed he was going to be, he could have called the general contractor to explain the situation.**

○ Agree ○ Disagree

Submit When you finish, click submit to see how you scored.

What could Bob and Fred have done to prevent the injury from occurring, or what could they do to keep a similar injury from happening in the future?

---

21. **Fred could have asked Bob to show him how to throw the blocks properly.**

◉ Agree ○ Disagree

Correct. Safety is as much the worker's responsibility as it is the boss's. Workers need to let the boss know when they're not sure how to do things the right way.

---

22. **In the future, Bob could demonstrate materials-handling and safe lifting to all new and inexperienced workers.**

◉ Agree ○ Disagree

Correct! Less experienced workers may fear for their job if they admit they don't know how to do something. Bob's experience makes him an ideal coach and teacher.

---

23. **Bob could have made Fred wear a back support belt.**

◉ Agree ○ Disagree

Incorrect! Back belts alone may not prevent an injury, especially if improper lifting techniques are used. In some cases, back belts may even lead to a false sense of security about how much weight workers can lift safely.

---

24. **Fred could tell any new help about how his injury happened, and how pacing work and lifting properly can protect them.**

◉ Agree ○ Disagree

Correct! Safety reminders from peers that are based on personal experience can be very effective.

---

25. **When time pressure is on, Bob could remind his employees that doing things safely is still a priority because it will help everyone stay injury-free so they can get a full week's pay for a full week's work.**

◉ Agree ○ Disagree

Correct! Loyal workers aim to please. If the only message they get is to hurry at all costs, injuries are more likely, and quality will suffer.

---

26. **As soon as Bob realized how short-handed he was going to be, he could have called the general contractor to explain the situation.**

◉ Agree ○ Disagree

Correct! They might have been able to make some alternate arrangements for getting the job done, or bought Bob a little time to hire and train some extra help.

Not bad! Keep up the good work.

[next]

Email a comment

UK Lessons Evaluation Form KIPRC

Congratulations, you have completed Bob's Builders.

Please complete the questions below. When you finish, click the Submit button to send your information to the UK developers. If you prefer not to, just click the UK logo to begin another lesson.

1) **The story was easy to read.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

2) **Once I got started it was easy to use the computer.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

3) **The directions in the story were easy to understand.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

4) **The pictures in the story were helpful.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

5) **I liked getting immediate feedback on whether my answers were correct.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

6) **It took too long to complete the story.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

7) **This exercise offered practical ways to prevent problems like the ones in the story.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

8) **The economic and financial information in the story is realistic.**

- ○ strongly disagree
- ○ disagree
- ○ agree
- ○ strongly agree

9) **The problems in the story are realistic.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

10) **I liked making choices about what the person should do as the story progressed.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

11) **It is likely that I will discuss issues raised in the story with my co-workers.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

12) **I would recommend to my co-workers that they complete this exercise.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

13) **I would like to have more of these types of stories for safety training.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

14) **The characters in the story are like people I've worked with.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

15) **There was little of value in the story for me.**

○ strongly disagree
○ disagree
○ agree
○ strongly agree

16) **If you have any general comments or suggestions, please type them in the box below:**

Submit When you are finished, click the Submit button to send your opinions to the developers. Thank you!

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service
Centers for Disease Control
and Prevention (CDC)

Memorandum

Date: March 16, 2001

From: Roy M. Fleming, Sc.D., Director, Research Grants Program RMF
Office of Extramural Programs, NIOSH, D30

Subject: Final Report Submitted for Entry into NTIS for Grant 5 R01 CC413067-01.

To: William D. Bennett
Data Systems Team, Information Resources Branch, EID, NIOSH, P03/C18

The attached final report has been received from the principal investigator on the subject NIOSH grant. If this document is forwarded to the National Technical Information Service, please let us know when a document number is known so that we can inform anyone who inquires about this final report.

Any publications that are included with this report are highlighted on the list below.

Attachment
cc: Sherri Diana, EID, P03/C13

List of Publications

Kidd PS, Parshall M: Getting the Focus and the Group: Enhancing Analytical Rigor in Focus Group Research. Qualitative Health Research 10(3):293-308, 2000

Title: Intervention Studies for Construction Safety and Health
Investigator: Pamela Kidd
Affiliation: University of Kentucky Research Foundation
City & State: Lexington, KY
Telephone: (606) 257-6711
Award Number: 5 R01 CC413067-01
Start & End Date: 9/30/1996–9/29/2000
Total Project Cost: $496,004
Program Area: Intervention Effectiveness Research Methods
Key Words:

Abstract:
Background: The goal of this study was to develop and test the effectiveness of a safety training intervention for employees, supervisors, and owners of small construction firms (< 10 employees) in Kentucky. The project involved a partnership between the Kentucky Injury Prevention & Research Center (KIPRC) and Kentucky Employers' Mutual Insurance (KEMI). The project was in two phases over a three year interval. Phase 1 (Year 1) consisted of intervention development and authentication activities. Phase 2 (Years 2 and 3) consisted of intervention dissemination and evaluation.

The intervention consisted of a series of six reality-based latent-image, narrative simulation exercises targeted to the prevention of falls or back injuries. They were designed to emphasize the economic impact of injuries and benefits of individual and organizational injury prevention strategies. The simulations, developed in Year 1, were based upon findings from a series of focus groups of small construction company owners and employees held in each of eight regions in Kentucky. In each year of Phase 2, three of the simulations were administered.

Design: The study design used to test the intervention in Phase 2 was quasi-experimental. In each year of Phase 2, intervention participants took pre-test (PRE) and immediate post-test (IPT) measures concurrently with the simulations. Delayed post-test (DPT) and concurrent retrospective pre-test (RPT) measures were administered to intervention participants three to four months after the intervention. In Year 2, the intervention group was subdivided into participants who attended a group administration meeting and participants who completed simulations at home. Control group subjects took concurrent PRE and RPT measures. Hypotheses tested were:

(1) Workers who participate in a training program consisting of six simulations (3 for fall prevention and 3 for back injury prevention) experience fewer injuries and submit fewer worker compensation claims than those workers who do not participate.

(2) Worker compensation claims filed by Kentucky Employers Mutual Insurance (KEMI) companies that participate in a simulation training program differ significantly from claims submitted by non-participating KEMI companies and companies not insured through KEMI.

Additional research aims included:

(3) Examining the differences in safety climate, safety attitude, and self-efficacy among the home-administration and control groups; and

(4) Exploring reasons for non-participation in a safety training program.

Sample: The intervention group consisted of owner-operators, supervisory personnel, and employees. In Year 2, the treatment was stratified into home or group administration, but participation in group sessions was poor (n = 38). Therefore, in Year 3, group administration ceased, while home administration was maintained (n = 260 for Years 2 and 3). In both years, a no-treatment control group (n = 95 for Years 2 and 3) consisted entirely of owner-operators or supervisory personnel.

Results: Participant and control owners/supervisors were highly experienced and employed full time. The mean years of construction experience among non-supervisory employees was at least 9 years in both years of Phase 2. Control subjects were somewhat more experienced in construction and put in longer hours than owners/supervisors in the intervention group, but both groups were highly experienced in construction (Means ≥18 years) and worked full-time. There were no differences between intervention participants and controls on a pre-test measure of safety climate in either year. In both Year 2 and Year 3, simulation performance scores were relatively high (overall means ≥ 79% of maximum), and simulation evaluations were generally favorable (overall means ≥ 82% of maximum). In Year 2, there was no significant difference between PRE and DPT scores on the safety climate measure. However, scores on the RPT (a mean of 2 items) were significantly lower than the scores on the corresponding PRE and DPT items. This suggested a possible response-shift (i.e., the intervention may have influenced subjective calibration judgments with respect to the measure being used). In Year 3, using a revised and more reliable safety climate measure (10 items; a = .89) there was no significant difference between PRE and RPT or PRE and DPT measures in the intervention group.

In terms of claims experience, between the inception of KEMI in 1995 and May 1999, 61 claims of any type occurred in 19 of 147 companies (13%) who participated in the intervention in Year 2 or Year 3. Of those 61 claims, 7 (from 3 companies) were for back injuries and 12 (from 8 companies) were claims resulting from falls. In the control group, over the same interval, 82 claims of any type occurred among 58 of 389 companies (15%). Of those 82 claims, 17 were for back injuries (16 companies) and 25 were fall-related (22 companies). There were not enough cases for meaningful inferential analysis of a treatment effect on claims. There were no significant differences in the number or cost of claims between intervention participants and controls over this claims history period. It also turned out that there was no feasible way to link Kentucky Department for Workers Claims insurer data to individual claims. Therefore, comparisons between KEMI and non-KEMI claims could not be made.

The most frequently reported reasons for not participating in Years 2 and 3 were: "Time involved too much for me"; and "Company already has good safety record". The most

frequently selected reasons for participating were "Will get insurance discount" (80%, n = 123) and "Safety is a priority for our company" (68%, n = 104).

Conclusions: In the small construction outfits whose owners agreed to participate or were willing to serve as controls, safety climate is a valued and stable characteristic. Despite not showing an impact on safety climate or claims, simulation evaluations suggested that participants found them realistic and worthwhile. Simulation exercises may provide a reinforcement of good safety practices rather than new knowledge or impetus for behavioral change in highly experienced workers. Claims experience was far less than expected. Smaller construction outfits may actually be safer overall than larger construction companies; despite being relatively less regulated.

Publications

Kidd PS, Parshall M: Getting the Focus and the Group: Enhancing Analytical Rigor in Focus Group Research. Qualitative Health Research 10(3):293-308, 2000