Development of a Work Safety Scale

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List of Abbreviations

Abbreviation	Meaning
CSB	Compliance with Safety Behaviors
GHQ-12	General Health Questionnaire-12
JSI	Job Stress Index
OHS	Occupational Hazards Survey
PDD	Physical Demands and Dangers Scale
PWHS	Perceptions of Workplace Hazards Scale
SCS	Safety Climate Survey
WSS	Work Safety Scale

Significant Findings

The specific aim of the present research was to develop a questionnaire assessing employees' attitude toward workplace safety. Scores on this measure should allow decision-makers in industrial settings to: (1) predict the extent of accidents; (2) determine the need for workplace safety programs; (3) help organizational officers design specific workplace safety programs to address specific employee concerns; and (4) determine the effect of such safety programs.

Following are the significant findings that relate to the specific aim of this project.

1. The Work Safety Scale had acceptable psychometric properties across two independent samples.
   a) The Work Safety Scale subscales had high reliability estimates (internal consistency) across two independent samples. In the first study, all reliability estimates were above .90. In the second study, all reliability estimates were above .88.
   b) A factor analysis of the Work Safety Scale revealed a clear 5-factor solution, each factor representing one of the five Work Safety Scale subscales. The subscales were: a) Job Safety, b) Co-worker Safety, c) Supervisor Safety, d) Management Safety Practices, and e) Satisfaction with the Safety Program.

2. The Work Safety Scale subscales were significantly related to accident-related variables.

   a) The Work Safety Scale subscales were significantly related to reported accident rates on the job. People who perceived their jobs as safe reported experiencing fewer accidents (reported, unreported, and near accidents) than people who reported their jobs as less safe.

   b) The Work Safety Scale subscales were significantly related to compliance with safety behaviors. People who perceived their jobs as safe complied with safety behaviors on the job more frequently than people who perceived their jobs as less safe.

3. The Work Safety Scale subscales that assessed the social work environment (e.g., management safety practices, supervisor safety, co-worker safety) were the best predictors of accident rates and compliance with safety behaviors. These results were found even after controlling for the effects of gender and age in first study, and controlling for the effects of gender, age, job satisfaction, and job stress in the second study. Although the other Work Safety Scale subscales were related to the outcome variables, it seems that the predictability of accidents and compliance with safety behaviors can be explained best by these social work environment variables.

4. The Work Safety Scale subscales were significantly related to health-related variables and job-related attitudes.

a) The Work Safety Scale subscales were significantly related to health complaints, psychological complaints, and sleep complaints. People who perceived their jobs as safe reported fewer health problems, fewer sleep complaints, and fewer psychological complaints compared to people who perceived their jobs as less safe.

b) The Work Safety Scale subscales were significantly related to job satisfaction and job stress. People who perceived their jobs as safe reported higher levels of job satisfaction and lower levels of job stress compared to people who perceived their jobs as less safe.

Usefulness of Findings

A reliable and valid employee attitude assessment of work safety can be easily accomplished with the Work Safety Scale. The Work Safety Scale provides the organization useful information regarding the safety climate of the company. If the safety climate is poor, the organization can take corrective action before the problem becomes serious.

The Work Safety Scale can be used to assess the employees' attitude toward the current safety program of the company. Additionally, if the safety program is modified based on the Work Safety Scale survey results, a re-administration of the Work Safety Scale after the program has been changed can demonstrate if employees' perceptions improved.

The Work Safety Scale is a standardized measure that was designed to be used across many different types of organizations. Consequently, using the Work Safety Scale, a company could be able to make intra-company, inter-company, and inter-industry comparisons regarding their employees' perceptions of work safety. This benchmarking approach would provide a company valuable safety information. Companies could compare their results with other sources to determine how they could increase the safety climate of their company.

The current studies demonstrated that improving the safety record of a company (e.g., increase employees' compliance with safety behaviors, decrease accident rate) should include attention to management's role in safety (Murphy et al., 1993).

Employees who perceived that their supervisor was concerned with safety reported complying with safety behaviors more frequently than employees who perceived that their supervisors were not concerned with safety. Perhaps the accident process is influenced by the social work environment in which the employees work. Management is responsible for setting up safe work systems, and enforcing those systems.

The content of the items in three of the Work Safety Scale subscales (Co-worker, Supervisor, and Management) reflect behaviors of each of the respective sources. Consequently, the specificity of these items may allow organizations to determine why employees' perceptions of work safety may be poor and can provide a means to improve work safety perceptions. The use of the Work Safety Scale would allow an organization to provide specific feedback to these sources of safety in order to improve the safety climate of the organization. Increasing safety climate along these dimensions may lead to a decrease in accident rates and an increase in compliance with safety behaviors on the job.

In addition, the Work Safety Scale may be of help to researchers in better understanding the determinants and consequences of industrial accidents. By understanding the accident process (the precursors and consequences of accidents), researchers can advance the knowledge base of industrial accidents and, as a result, make the work place a safer place in which to work.

Abstract

Two purpose of this paper is to present two studies that were aimed at developing and validating a measure of employees' perceptions of work safety, the Work Safety Scale (WSS). The WSS was designed to assess five facets of perceptions of work safety: a) Job Safety, b) Co-worker Safety, c) Supervisor Safety, d) Management Safety Practices, and e) Satisfaction with the Safety Program. In the first study, 124 preliminary items for the WSS were generated and administered to 787 subjects from a wide range of occupations. Based on item content and items statistics, 50 items were retained for the final WSS measure (10 items for each subscale). An exploratory factor analysis of the 50-item WSS revealed a clean 5-factor solution, each factor representing one of the WSS subscales. In addition, results showed that each of the WSS subscales had reliability estimates (internal consistency estimates) above .90. In addition, all WSS subscales were negatively related to self-reported accident rates. That is, as perceptions of work safety improved, people reported experiencing fewer industrial accidents. Based on stepwise regression analysis, the best predictor of industrial accidents were: 1) co-worker safety, 2) management safety, 3) satisfaction with the safety program, and 4) job safety. For the second study, the WSS was administered to an independent sample of people. Other measures were included as part of the survey, including self-reported accident rates, health indices, job satisfaction, job stress measures, and compliance with safety behaviors. Results of the second study showed that each of the WSS subscales had high internal consistency estimates (above .88). In addition, the WSS subscales were logically correlated with the other study variables. Results showed

that people who indicated their jobs were safer reported experiencing fewer accidents on the job, higher levels of job satisfaction, better health, lower levels of job stress, and reported greater compliance with safety behaviors compared to people who reported having a less safe work environment. Based on stepwise regression analysis, the best predictors of accident rates were management safety and job safety. Additionally, the best predictors of compliance with safety behaviors was supervisor safety and co-worker safety. Overall, the series of studies showed that the 50-item WSS is a reliable and valid measure of perceptions of workplace safety. Internal consistency estimates were high for all WSS subscales across two independent samples. Additionally, the WSS subscales were related to accident rates, health indices, job-related attitudes, and compliance with safety behaviors.

Body of Report

The purpose of Phase I was to develop and validate a measure of employees' perceptions of work safety, the Work Safety Scale. Two separate studies were conducted during the grant period. Items for the Work Safety Scale were generated and administered to a sample of respondents. Item analysis was conducted on the Work Safety Scale items. Subscale scores of the WSS were correlated with other study variables (e.g., accident rates, health complaints, job satisfaction, compliance with safety behaviors) to provide evidence of the validity of the inferences made from scores derived from the WSS.

Specific Aim

The specific aim of the present research was to complete Phase I of the development of a questionnaire assessing employees' attitude toward workplace safety. This questionnaire can be used by private and public industries, and by researchers with interests in work safety. Scores on this measure will assist decision-makers in industrial settings to: (1) predict the extent of accidents; (2) determine the need for workplace safety programs; (3) help organizational officers design specific workplace safety programs to address specific employee concerns; and (4) determine the effect of such safety programs. In addition, this measure may be of help to researchers in better understanding the determinants and consequences of industrial accidents. Such information should ultimately assist in controlling costs in industry by helping prevent losses due to injury-related decreases in productivity, as well as by helping lower insurance and medical costs caused by industrial injury.

Significance

In 1992, industrial accidents were responsible for an estimated cost of $115.9 billion, including administrative expenses, wage losses, and medical costs (NSC, 1993). In addition, industrial accidents occurring in 1992 were responsible for an estimated loss of 105 million days in 1992 and will be responsible for an estimated loss of 110 million days in future years (NSC, 1993). Thus, industrial accidents are costly to both individual companies and the country as a whole. Reducing the rate of industrial accidents could conceivably save the nation billions of dollars annually.

A number of variables related to industrial accident rates have been found to be associated with workers' perceptions of safety on the job. Employees who perceive their jobs as safe tend to be involved in fewer accidents than employees who perceive their jobs as relatively more dangerous (Guastello, 1988; Harrell, 1990, Smith, Kruger, Silverman, Haff, Hayes, Silverman, & Mattimore, 1992), and employees who perceive their workplace as safe report lower levels of job-related anxiety and stress, and exposure to fewer environmental hazards (Guastello, 1992). Work-related stress and workplace hazards have been strongly linked to accident rates (Guastello, 1989, 1991), which further argues for indirect --but important --connections between perceptions of workplace safety and industrial accident rates. Such connections cannot be adequately researched using existing work safety measures because of conceptual and design weaknesses inherent to each measure.

Current Measures of Perceptions of Workplace Safety

A current review of the literature revealed only four measures of perceptions of workplace safety: a) the Occupational Hazards Survey (Guastello & Guastello, 1988), b) the Safety Climate Survey (Zohar, 1980), c) the Physical Demands and Dangers (Sandman, 1992), and d) the Perceptions of Workplace Hazards scale (Smith et al., 1992). The first two measures were designed to assess multiple dimensions of workplace safety. The latter two measures were designed as unidimensional measures of workplace safety.

The Occupational Hazards Survey (OHS). The OHS is a multidimensional scale that purportedly assesses 11 dimensions of work safety attitudes: a) age-experience; b) safety program management, i.e. perceptions of existing safety climate; c) danger perception, i.e. perceptions of environmental hazard levels; d) belief structure, internal vs. external; e) anxiety; f) life stress, counted as the number of stressful life events; g) environmental hazards, i.e. actual machine and building hazards and the physical lifting required at work; h) physical stressors; i) hazardous tools; j) disregulation, i.e. an overall factor consisting of stressful life events and anxiety health symptoms; and k) housekeeping, consisting of special management activities and hazardous conditions related to housekeeping.

Subscale reliabilities (coefficient alpha) have been reported in two different studies as follows: a) age-experience, .69 and .72; b) safety program management, .74 and .76; c) danger perception, .62 and .62; d) belief structure, .56 and .56; e) anxiety, .73 and .75; f) life stress, .28 and .38; g) environmental hazards, .83 and .83; h) physical stressors, .48

and .52; i) hazardous tools, .86 and .87; j) disregulation, .30 and .30; and k) housekeeping, .61 and .62 (Guastello & Guastello, 1988). Some of these coefficients are quite low, suggesting that items within some of the subscales may be poor indicators of a single, underlying construct. Rather, items within a given scale may really reflect different content areas. Additionally, observed low reliabilities could be due to the fact that some subscales may have a small number of items. Unfortunately, the exact number of items in each subscale is not reported (Guastello & Guastello, 1988). More likely, different subscales may show considerable overlap with one another, so that the OHS is actually measuring fewer than 11 dimensions. Because a complete correlation matrix of the subscales is not reported however, this point is difficult to assess.

The only information available regarding the validity of the OHS regards a positive relationship noted between OHS scores and accident rates. Workers who report experiencing more accidents at work report higher levels of danger perception, more hazards in the work environment, and use more hazardous tools than workers who report experiencing less accidents (Guastello, 1989, 1991, 1992; Guastello & Guastello, 1988).

Safety Climate Scale (SCS). The SCS purportedly assesses eight dimensions of perceptions of work safety: a) importance of safety training programs, b) management attitudes toward safety, c) effects of safe conduct on promotion, d) level of risk at work place, e) effects of required work pace on safety, f) status of safety officer, g) effects of safe conduct on social status, and h) status of safety committee. Psychometric information concerning the SCS is minimal. To date, no studies have been done that

report either internal consistency estimates of the subscales or indices of the degree of interrelationship among the eight subscales. A recent factor analysis of the SCS done by Brown and Holmes (1986) found evidence of only three factors rather than the original eight that were hypothesized by Zohar, suggesting the degree of overlap of the eight scales is quite high. According to these authors (Brown & Holmes, 1986), the SCS appears to tap three general areas: a) physical risk perception, b) management concern for employee well-being, and c) management responsiveness to this concern.

Some evidence has been collected suggesting that SCS scores are related to expert judges' rankings of factory safety practices and accident-prevention programs (Zohar, 1980). Factories that were ranked as the most dangerous by judges were rated by employees within those factories as having a less safe working environment than factories that judges had ranked as less dangerous.

Physical Demands and Dangers (PDD). The Physical Demands and Dangers (PDD) scale is a subscale of Sandman's (1992) Job Stress Index (JSI), which contains 11 subscales including the PDD scale. The nine-item PDD scale has been found to have a reliability (internal consistency) estimate of .81, although nothing else is known about its psychometric properties.

Perceptions of Workplace Hazards Scale (PWHS). Item generation of the PWHS was guided by concerns identified by Smith, Cohen, Cohen and Cleveland (1978) relating to organizations that have successful safety programs. This 10-item scale has a reported reliability estimate (internal consistency) of .71, which is not considered adequate by some standards (e.g. Nunnally, 1978). Criterion related validity for the

PWHS has been demonstrated in one study (Smith et al., 1992) using a sample of workers in the light metal-working industry. Scores on the PWHS were positively related to the number of unreported accidents (r = .20) and near accidents (r = .24) (Smith et al., 1992). People who perceived their job as more hazardous also reported experiencing more accidents in the previous 12 months. There is no additional validity information for the PWHS.

Summary

Although several existing measures of workplace safety exist, they suffer with respect to either their limited sampling of the work safety content domain or their psychometric integrity. The reliability and validity of each instrument is not well established, and no measure adequately taps the domain of workplace safety. Thus, there is a need for a comprehensive and psychometrically sound instrument to assess issues of workplace safety. The purpose of the present study was to develop an instrument that would: a) possess adequate psychometric integrity - reliability and validity; b) comprehensively assesses important dimensions of perceptions of workplace safety; and c) be easy to complete.

Structure and Content of the Instrument

The series of proposed studies was designed to develop and validate a measure of workplace safety, the Work Safety Scale (WSS). Previous researchers examining the measurement of perceptions of workplace safety have attempted to tap multiple content areas regarding safety practices of an organization (Guastello & Guastello, 1988; Smith et al., 1992; Zohar, 1980). However, the results of these studies suggest that,

despite the scale items sampling various content domains, either one factor or a limited number of factors can describe the items in the scale (Smith et al., 1992; Zohar, 1980).

Components of Work Safety. A multidimensional approach to safety assessment was taken in the current study due to the evidence that work safety rubric subsumes a number of different factors (Cleveland, Cohen, Smith, & Cohen, 1979), including management's commitment toward safety, the quality of safety training, and the safety behaviors of both coworkers (Guastello, personal communication, August 27, 1992) and supervisors. Because workers may have different attitudes toward the various components of job safety (e.g., perceiving one's coworkers and supervisor to practice safe work behaviors and, at the same time, perceiving one's workplace to be an unsafe work environment), it is necessary for researchers and practitioners to have the tools to assess the various dimensions of work safety.

The empirical findings suggest that people can distinguish among only a few facets of work safety (Brown & Holmes, 1986; Zohar, 1980; Smith, 1992). The sample of items in the current measures, however, may be responsible for these results. For example, the content domain sampled by current measures of perceptions of works safety may limit the number of factors found in a factor analysis of these scales.

There is considerable empirical evidence that measures of work satisfaction can reliably distinguish different facets of work attitudes, including the work itself, co-workers, supervisors, pay, and promotion (Smith et al., 1987). In addition, other researchers (Caplan et al., 1975; Hayes, 1992) have developed measures of employees' perceptions of work social support across different sources of support (e.g., supervisor,

co-workers, and spouse, friends and relatives). Factor analyses of such scales clearly show that sources of support represent empirically distinct constructs. Thus, the various content domains of work safety mentioned in the work safety literature and work attitude measurement suggest that the measurement of multiple facets of work safety is possible. A five-facet measure of work safety was proposed for the current study. The content of each of the sub-scales is presented below.

Sub-scale 1) Perception of Job Safety. Perception of job safety is an important measure because of its empirical relationship with accident occurrence and its potential use as a risk factor for future accident occurrence. For example, among the different facets of work-related safety that have been assessed, empirical evidence suggests that overall perception of job safety is the best predictor of accident occurrence. It may also be used as a useful measure for determining the effectiveness of organizational interventions designed to eliminate current safety problems and/or to design safety features into the work environment.

Sub-scale 2) Co-worker Safety. The purpose of this scale is to provide a reliable assessment of coworker safety, and especially coworker safety behaviors. Attitudes toward coworkers are thought to be determined, in part, by the interactions with one's fellow employees (Smith et al., 1969). As close-knit work units are being used more frequently in manufacturing industries, it is increasingly common for injuries to be related, in part, to the unsafe work practices of one's coworkers (Guastello, personal communication, August 27, 1992). In fact, some researchers presently examining accident data at the group level (Guastello, 1989), have suggested that the focus of work

safety should be extended to include coworkers who form the group. Co-worker safety may reflect work norms that define acceptable job behaviors by its group members. According to Fishbein and Azjen's (1975) theory of reasoned action, social norms (in this case, social norms regarding work safety) may affect actual safety behaviors of the members in that group. No other scale assesses co-worker safety.

Sub-scale 3) Supervisor Safety. This sub-scale will assess the extent to which employees perceive their supervisors as practicing and promoting safety in their work areas. There is strong evidence that the extent to which the supervisor is perceived as competent on the job is related to the employees' level of satisfaction with the supervisor (Smith et al., 1969; Vroom, 1964).

Sub-scale 4) Management Safety Practices. This sub-scale will focus on workers' perception of management's commitment to safety. There is some empirical evidence that suggests that one of the two dominant factors of work safety is management's concern for employee safety (Brown & Holmes, 1986). Moreover, management commitment to safety appears to be correlated with various accident-related variables, in that low-accident companies have management who are committed to safety relative to high accident companies (Zohar, 1980). Furthermore, there is some evidence that management commitment to safety is related to employee safety behaviors (Murphy et al., 1993).

Sub-scale 5) Satisfaction with the Safety Program. Organizations that have a good history of low accident occurrence typically are organizations that have good safety programs (Zohar, 1980). This sub-scale will provide a reliable measure of employees'

satisfaction with the safety program being used in their workplace. The content of the items reflect different aspects of the safety program, including the extent to which it prevents accidents, whether it applies to the workplace, and general attitudes toward the safety program. Respondents will be asked to indicate whether a safety program (or policy) exists in their organization. If a safety program does exist, the respondents will be asked to indicate their degree of satisfaction with that safety program.

Measures of perceptions of workplace safety essentially indicate the extent to which employees perceive their work setting to be safe from injury. A reliable and valid measure of attitudes toward workplace safety is needed for both scientific and practical reasons. Such a measure would provide researchers with a psychometrically sound instrument to better understand the accident process. In addition, a measure of workplace safety would provide practitioners a tool with which to assess and evaluate current safety practices in organizations, which may consequently allow for a safer workplace. At present however, there are no standardized self-report instruments with acceptable psychometric properties that comprehensively assess employee attitudes toward workplace safety issues. Some measures do not tap multiple dimension of perceptions of workplace safety (Sandman, 1992; Smith et al., 1992), while other measures do not possess adequate psychometric properties or lack necessary psychometric information (e.g., factor structure, intercorrelations among the subscales) regarding their measurement quality (Guastello & Guastello, 1992, Zohar, 1980).

Based on the work safety literature regarding measures of perceptions of work safety (Guastello & Guastello, 1988; Sandman, 1992; Smith et al., 1992; Smith et al., 1987;

Zohar, 1980) and studies and reviews dealing with different aspects of work safety, including quality of safety programs, predictors of safety compliance behaviors, and safety management (Brauer, 1990; Cleveland et al., 1979; Murphy, Sturdivant, & Gershon, 1993; National Safety Council, 1967; Petersen, 1975, 1978), a five-facet measure of work safety was proposed for the Phase I studies. The five content domains assessed by the WSS were: a) Global Perception of Job Safety; b) Co-worker Safety; c) Supervisor Safety; d) Management Safety Practices; and e) Satisfaction with the Safety Program.

Study I

The purpose of Study I was to generate the items for the WSS and determine the psychometric properties of the WSS. Item generation was guided by review of the scientific literature related to safety. This literature included research articles dealing directly with the measurement of perceptions of work safety and job attitudes (Guastello & Guastello, 1988; Sandman, 1992; Smith et al., 1992; Smith et al., 1987; Zohar, 1980) and studies and reviews dealing with different aspects of work safety, including quality of safety programs, predictors of safety compliance behaviors, and safety management (Brauer, 1990; Cleveland et al., 1979; Murphy, Sturdivant, & Gershon, 1993; National Safety Council, 1967; Petersen, 1975, 1978). This review helped in the scale development process in two ways: a) identify the broad content areas of industrial safety to be measured, and 2) generate specific items to clarify and define the broad content areas.

Method

Subjects. Respondents for Study I consisted of patients being seen at a medical consulting firm for independent medical evaluations. In addition to a standard questionnaire patients complete for their medical evaluation (not used in the current study), patients were given the initial items of the WSS and other measures used for the current study. Responses to the WSS were anonymous. Out of 5551 patients seen during a six-month period, 787 patients completed the materials used in the current study for a response rate of 14%.

Work Safety Scale (WSS). Twenty to Twenty-nine declarative statements were generated for each of the five content domains; total item pool equaled 124. These items were representative of statements typically found in safety evaluation programs (Petersen, 1978). Items for the WSS were written to reflect a diverse set of items, including items that reflected actual behaviors (e.g., Keeps workers informed of safety rules, and Trains workers to be safe) and items that focused more on general attitudes (e.g., Committed to safety, and Ensures workers' safety).

For each item, respondents were asked to indicate the extent to which they agreed that the item described its respective content domain. A five-point rating scale was used for each of the WSS items (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree).

Accidents. Three different accident indices were used in the current study. On the survey, each respondent indicated how many accidents he/she experienced in the last 12 months: a) reported accidents (reported to your supervisor), b) unreported accidents

(not reported to your supervisor), and c) near accidents (something that could have caused an injury but did not). There is some support that self-reported accident rates are related to accidents rates obtained from personnel files (Smith et al., 1992). Due to the non-normality of the distributions (positively skewed) of the accident variables, the accident data were transformed using the square root transformation.

Other Variables. Respondents were asked to indicate their job title. Job titles were coded using the Standard Occupational Classification Manual (U.S. Department of Commerce, 1980) by an undergraduate research assistant. Another research assistant independently coded 50 questionnaires. There was 77 percent agreement on the coding for job category. Thus, the coding of the initial rater was used to establish job categories. Jobs were divided into white and blue collar categories. Age and gender information were also collected.

Results

The demographic information is presented in Table 1.

For each of the five (5) WSS subscales, corrected item-total correlations ranged from .33 to .78 (Job Safety), .49 to .78 (Co-worker Safety), .62 to .85 (Supervisor Safety), .54 to .89 (Management Safety Practices), and .31 to .81 (Satisfaction with the Safety Program). For three of the WSS subscales (Co-worker, Supervisor, and Management), items were retained based on the content of the items. Behavioral items were selected over items that were less behavioral. Behavioral items were selected because they allowed for more specific feedback and, consequently, provided a more viable means of increasing

work safety. For the other two WSS subscales (Job Safety, and Satisfaction with the Safety Program), item selection was based the mathematical properties of the items.

As a result of this process, each WSS subscale contained 10 items and had high internal consistency estimates: .91 (Job Safety), .91 (Co-worker Safety), .95 (Supervisor Safety), .95 (Management Safety Practices), and .93 (Satisfaction with the Safety Program). The final version of the WSS is presented in Table 2.

An exploratory principal factors analysis (with oblique rotation) was conducted on the 50 retained items to determine the dimensionality of the entire WSS. As expected, a five-factor solution revealed a clean pattern of results. The first five factors accounted for 63% of the total variance. All items within their respective scales loaded on their primary factor. Although high cross-factor loadings between Supervisor and Management Safety were evident, none of the cross-factor loadings were higher than the primary loadings. A four-factor solution, however, showed a clean pattern of results. In this analysis, the supervisor and management safety subscales collapsed onto a single factor. The five-factor solution (after rotation) is presented in Table 3.

Next, the five WSS subscale scores (calculated by summing items within their respective WSS subscales) were correlated with the other study variables. The correlation matrix is presented in Table 4. As seen in the appendix, the correlations among the WSS subscales ranged from .34 to .82. All WSS subscales were negatively related to all of the self-reported accident variables. Stepwise regression analyses (Table 5) were conducted to determine the unique contribution of the WSS subscales in predicting accident rates (after partialling out the effects of age and gender). Only

significant WSS predictors are reported in the appendix. The best predictors of accidents were co-worker safety, management safety, satisfaction with the safety program, and job safety.

Discussion

The present study was designed to develop and evaluate a measure of perceptions of work safety. Preliminary evidence supports the hypothesis that the WSS assesses five empirically distinct constructs. WSS items clearly loaded on five distinct factors. In addition, the intercorrelations among the WSS subscales were low relative to each subscale's reliability.

Employees who perceived their jobs as more safe reported experiencing lower levels of self-reported accidents compared to employees who perceive their jobs as less safe. These relationships support previous research on perceptions of work safety (Guastello & Guastello, 1988, Smith et al., 1992).

Study II

The purpose of Study II was to cross-validate the finding of Study I. The psychometric quality of the WSS subscales were evaluated in a new sample of respondents. Additional validity evidence will be provided in the current study. Researchers have found that perceptions of work safety are related to measures job satisfaction and job stress (Guastello, 1992). In addition, perceptions of work safety have been shown to be related to health-related variables (Guastello, 1992).

An important aspect in having a safe work environment is the behavior of the employees. Some jobs require employees to follow certain safety precautions or

regulations when performing some job functions. The extent to which employees follow safety precautions has been shown to be related to employees' perceptions of managment safety (Murphy et al., 1993). Specifically, using a hospital sample, Murphy et al. (1993) found that employees were more likely to follow Universal Precautions if they perceived that management was committed to a safe work environment. Thus, employees' perceptions of work safety may affect their safety behaviors on the job. The following study was designed to determine if other aspects of employees' perceptions of work safety were related to employees' compliance with safety precautions. The current study included measures of job satisfaction, job stress, measures of psychological and physical complaints, and a measure of compliance with safety behaviors.

Method

Subjects. Data for this study were collected using the same method as Study I. Responses to the WSS were anonymous. Out of 8464 patients seen during a four-month period, 879 patients completed the materials used in the current study for a response rate of 10%.

Work Safety Scale (WSS). The 50-item WSS was used in the current study.

Sleep Complaints. A 5-item measure of sleep complaints was used in the current study. This scale was used in an earlier study (Smith et al., 1992). The reliability (internal consistency) of this scale was .77. Higher scores indicated a greater degree of sleep complaints.

GHQ-12. The General Health Questionnaire - 12 (GHQ-12) (Goldberg, 1978) was used in the present study. The GHQ-12 is designed to detect minor psychiatric disorders. For each item, respondents are asked to indicate, on a scale from 1 (Less so than usual) to 4 (Much more than usual), the extent to which the item describes them. The GHQ-12 has been shown to have high internal consistency across various samples (α = .82 to .90). Also, the GHQ-12 has been shown to be positively related to work demand and negative affectivity, and negatively related to work support and direct coping (Parkes, 1990). Additionally, the GHQ-12 has been shown to differentiate employed and unemployed samples; unemployed respondents showed higher scores (poorer mental health) than employed respondents (Banks, Clegg, Jackson, Stafford, & Wall, 1980).

Scores for the GHQ-12 were calculated by summing the 12 items in the scale and then dividing this number by the number of items in the scale. Possible scores range from 1 to 4. Higher scores indicated poorer mental health. In the present study, the internal consistency estimate for the GHQ-12 was .88.

Physical Complaints. The 11-item Moos et al. (1986) scale was used to assess the degree of physical complaints experienced by the respondent. In the present study, the internal consistency estimate for the Physical Complaints scale was .81.

Job Stress and Job Satisfaction. Job stress and job satisfaction were each assessed by a single-item measure. Respondents were asked to indicate, on a scale from 1 (The least stressful job imaginable) to 10 (The most stressful job imaginable), how much stress

they experience on their job. Also, respondents were asked to indicate, on a scale from 1 (Very dissatisfying) to 10 (Very satisfying), their level of satisfaction on their job.

Accidents. Similar to Study I, three different accident indices were used in the current study: a) reported accidents (reported to your supervisor), b) unreported accidents (not reported to your supervisor), and c) near accidents (something that could have caused an injury but did not). Accidents have been defined in multiple ways. There is some support that self-reported accident rates are related to accidents rates obtained from personnel files (Smith et al., 1992). Due to the non-normality of the distributions (positively skewed) of the accident variables, the accident data were transformed using the square root transformation. This transformation made the distribution more normal compared to the untransformed data. Consequently, the transformed accident data were used in the remaining analyses.

Compliance with Safety Behaviors. Finally, an 11-item measure of compliance with safety behaviors (CSB) was developed for the present study. The items in the CSB were written to apply to the various occupations used in the current sample. Each CSB item reflected either a safe or unsafe work behavior. The CSB items and their corrected item-total correlations are presented in Table 6.

For each of the CSB items, respondents were asked to indicate how frequently they do the behavior on their current job using a scale from 1 - "never" to 5 - "always". After recoding, higher scores reflected greater compliance with safe work behaviors. CSB scores were calculated by averaging the responses.

Job Categories. Respondents were asked to indicate their job title. Job titles were coded using the Standard Occupational Classification Manual (U.S. Department of Commerce, 1980) by an undergraduate research assistant. Jobs were separated into white and blue collar jobs.

Results

The demographic information is presented in Table 7.

The means, standard deviations and intercorrelations among the study variables are presented in Table 8. The internal consistency estimates for each of the WSS subscales were high (all above .88). In addition, the intercorrelation among the WSS subscales were low relative to these internal consistency estimates, suggesting that the five WSS subscales measure five empirically distinct constructs. Similar to Study I, the WSS subscales were negatively related to accident rates. Respondents reporting a safer work environment also reported experiencing fewer accidents than respondents reporting a less safe work environment.

The WSS subscales were related to the health-related measures. Specifically, the WSS subscales were negatively related to the General Health Questionnaire, Physical Complaints Questionnaire, and the sleep complaints questionnaire. Respondents who reported having a safe work environment also reported fewer health-related complaints compared to respondents who reported having a less safe work environment. Additionally, all WSS subscales were significantly related to compliance with safety behaviors. Specifically, people who perceived their jobs as safe complied

with safety behaviors at work more frequently than people who perceived their jobs as less safe.

Stepwise regression analyses (Table 9) were conducted to determine the unique contribution of the WSS subscales in predicting accident rates and compliance with safety behaviors (after partialling out the effects of age, gender, job stress and job satisfaction). Only significant WSS predictors are reported in the appendix. The best predictors of accidents were management safety, supervisor safety, and job safety. The best predictor of compliance with safety behaviors was supervisor safety and co-worker safety.

Conclusions

The results of the studies suggest that the WSS reliably measures five facets of employees' perceptions of work safety: a) Job Safety, b) Co-worker Safety, c) Supervisor Safety, d) Management Safety Practices, and e) Satisfaction with the Safety Program. Furthermore, the studies provide good evidence of convergent and discriminant validity for the WSS.

The results of these studies showed that the Work Safety Scale is a reliable and valid measure of employees' perceptions of work safety. A factor analysis of the WSS revealed a clean, interpretable 5-factor solution, each factor representing one of the five WSS subscales. Additionally, across two independent samples, the internal consistency estimates for each of the WSS subscales were high (above .88) and the correlations among the WSS subscales were relatively low, ranging from .28 to .82., suggesting that the WSS measured five empirically distinct constructs. Thus, the limited number of

factors measured by previous work safety questionnaires may not reflect the underlying dimensionality of work safety, but may be due to the inadequate sampling of the work safety content domain of these measures.

Supporting previous research on perceptions of work safety, WSS subscales were correlated with accident rates (reported accidents, unreported accidents, and near accidents) and compliance with safety behaviors. Employees who said they had a safer work environment reported experiencing fewer accidents than employees who said they had a less safe work environment. The WSS was related to compliance with safety behaviors. Specifically, employees who said the had a safe work environment complied with safety behaviors more frequently than employees who said they had a less safe work environment.

Additionally, the WSS was related to health-related variables and job-related variables. That is, employees who said their jobs were more safe reported fewer health complaints, physical complaints and sleep complaints compared to employees who said their jobs were less safe. Also, employees who had a safer work environment reported higher levels of job satisfaction and lower levels of job stress than employees who said they had a less safe work environment.

It is important to note that the Co-worker Safety and Management Safety Practices subscales were among the best predictors of accidents and compliance with safety behaviors. This is in line previous research supporting the importance of management safety in predicting accident-related variables (Murphy et al., 1993; Zohar, 1980). Thus, improving the safety record of a company (e.g., increase employees' compliance with

safety behaviors, decrease accident rate) should include attention to management's role in safety (Murphy et al., 1993). Also, these study showed that Co-worker Safety was a good predictor of accident rates and safety compliance behaviors. It seems that one's peers provide an effective source for increasing the safety climate of the organization which is indicated by lower accident rates and compliance with safe work behaviors.

The content of the items in three of the WSS subscales (Co-worker, Supervisor, and Management) reflect behaviors of each of the respective sources. Consequently, the specificity of these items may allow organizations to determine why employees' perceptions of work safety may be poor and can provide a means to improve work safety perceptions.

Models of the industrial accident process have included such variables as a person's social environment, employee behaviors at work, and personality variables (Hansen, 1988; Heinrich, 1959), each contributing directly, or indirectly, to accidents. Perhaps the role of a person's social work environment should be included in these models. The use of the WSS to measure employees' social work environment could provide insight regarding the determinants and consequences of industrial accidents.

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List of Present and Possible Publications

The following two papers were presented at national and international conferences. A copy of the written version of the first paper is presented in triplicate. The second was a presentation and no formal paper has yet been written for distribution.

Hayes, B. E., Johnson, P., Strom, S., Langlie, J., & Trask, J. (April, 1994). Development and Validation of the Work Safety Scale. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology in Nashville, TN.

Hayes, B. E., Perander, J., Trask, J., & Johnson, P. (July, 1994). Main and buffering effects of employees' perceptions of work safety. Paper presented at the International Congress of Applied Psychology in Madrid, Spain.

The following paper is being written and will be submitted to a refereed journal by the end of 1994.

Hayes, B. E., Perander, J., Tara Smecko. (in progress). Measuring employees' perceptions of work safety: The development and validation of the work safety scale.

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Table 1

Demographic Characteristics of Sample in Study I

Variable	Categories	Values
Gender:	Male	54.5%
	Female	45.5%
Age:	Mean	41 years
	Minimum	17 years
	Maximum	73 years
Educational Level:	Less than junior high school	1.5%
	Completed junior high school	0.6%
	Some high school	7.7%
	Completed high school	32.0%
	Some college	39.8%
	Completed college	13.0%
	Graduate school	5.5%
Occupation:	White	50.8%
	Blue	49.2%

Table 2

Work Safety Scale

Think about your current job. Using the scale below, please answer the following questions on the following pages.

Please write the job title here:_____

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I. Job Safety

Think about your job you indicated above. Do you agree or disagree that each of the following words or phrases describes your job? Circle one answer for each statement using the scale at the top of the page.

1.	Dangerous	1	2	3	4	5	6. Could get hurt easily	1	2	3	4	5
2.	Safe	1	2	3	4	5	7. Unsafe	1	2	3	4	5
3.	Hazardous	1	2	3	4	5	8. Fear for health	1	2	3	4	5
4.	Risky	1	2	3	4	5	9. Chance of death	1	2	3	4	5
5.	Unhealthy	1	2	3	4	5	10. Scary	1	2	3	4	5

II. Coworker Safety

Think about the people you work with. Do you agree or disagree that each of the following words or phrases describes these people? Circle one answer for each statement using the scale at the top of page.

1.	Ignore safety rules	1	2	3	4	5	6. Encourage others to be safe	1	2	3	4	5
2.	Don't care about other's safety	1	2	3	4	5	7. Take chances with safety	1	2	3	4	5
3.	Pay attention to safety rules	1	2	3	4	5	8. Keep work area clean	1	2	3	4	5
4.	Follow safety rules	1	2	3	4	5	9. Safety-oriented	1	2	3	4	5
5.	Look out for other's safety	1	2	3	4	5	10. Don't pay attention	1	2	3	4	5

III. Supervisor Safety

Think about your immediate supervisor. Do you agree or disagree that each of the following words or phrases describes your immediate supervisor? Circle one answer for each statement using the scale at the top of the page.

1.	Praises safe work behaviors	1	2	3	4	5	6. Discusses safety issues with others	1	2	3	4	5
2.	Encourages safe behaviors	1	2	3	4	5	7. Updates safety rules	1	2	3	4	5
3.	Keeps workers informed of safety rules	1	2	3	4	5	8. Trains workers to be safe	1	2	3	4	5
4.	Rewards safe behaviors	1	2	3	4	5	9. Enforces safety rules	1	2	3	4	5
5.	Involves workers in setting safety goals	1	2	3	4	5	10. Acts on safety suggestions	1	2	3	4	5

Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
1	2	3	4	5

IV. Management Safety Practices

Think about your management. Do you agree or disagree that each of the following words or phrases describes your management? Circle one answer for each statement using the scale at the top of the page.

1. Provides enough safety training programs 1 2 3 4 5
2. Conducts frequent safety inspections 1 2 3 4 5
3. Investigates safety problems quickly 1 2 3 4 5
4. Rewards safe workers..... 1 2 3 4 5
5. Provides safe equipment 1 2 3 4 5
6. Provides safe working conditions..... 1 2 3 4 5
7. Responds quickly to safety concerns . 1 2 3 4 5
8. Helps maintain clean work area 1 2 3 4 5
9. Provides safety information..... 1 2 3 4 5
10. Keeps workers informed of hazards... 1 2 3 4 5

Does your company have a formal safety program (policies)? (circle answer) Yes No Don't know

If you answered "Yes," please answer the following questions about the safety program (policies).

V. Safety Program (Policies)

Think about your safety program at work. Do you agree or disagree that each of the following words or phrases describes this safety program? Circle one answer for each statement using the scale at the top of the page.

1. Worthwhile..... 1 2 3 4 5
2. Helps prevent accidents..... 1 2 3 4 5
3. Useful..... 1 2 3 4 5
4. Good..... 1 2 3 4 5
5. First-rate 1 2 3 4 5
6. Unclear..... 1 2 3 4 5
7. Important..... 1 2 3 4 5
8. Effective in reducing injuries 1 2 3 4 5
9. Doesn't apply to my workplace.. 1 2 3 4 5
10. Does not work 1 2 3 4 5

Table 3

Factor Pattern Matrix (after rotation) of the Work Safety Scale for Study I

	Factor I	Factor II	Factor III	Factor IV	Factor V	h^2
JOB 1		**.73280**				.53897
JOB 2		**.51464**				.32827
JOB 3		**.79316**				.62965
JOB 4		**.80426**				.65022
JOB 5		**.66362**				.47675
JOB 6		**.73106**				.54909
JOB 7		**.72450**				.58987
JOB 8		**.71052**				.53167
JOB 9		**.67389**				.46133
JOB 10		**.68392**				.47534
CO-WORKER 1				**.69173**		.53225
CO-WORKER 2				**.70757**		.52307
CO-WORKER 3				**.58932**		.36171
CO-WORKER 4				**.77263**		.61544
CO-WORKER 5				**.82077**		.68772
CO-WORKER 6				**.77257**		.62376
CO-WORKER 7				**.69357**		.56634
CO-WORKER 8				**.41491**		.23406
CO-WORKER 9				**.74460**		.58919
CO-WORKER 10				**.64744**		.44795
SUPERVISOR 1	.50980				**.76364**	.62218
SUPERVISOR 2					**.72749**	.58930
SUPERVISOR 3	.52043				**.82238**	.69966
SUPERVISOR 4	.57417				**.71865**	.58229
SUPERVISOR 5	.57243				**.83142**	.72261
SUPERVISOR 6	.52058				**.82601**	.69888
SUPERVISOR 7	.51254				**.82974**	.71035
SUPERVISOR 8	.54363				**.82534**	.71666
SUPERVISOR 9	.56124				**.83049**	.74713
SUPERVISOR 10	.60841				**.80980**	.73045
MANAGEMENT 1	**.69136**				.59514	.58341
MANAGEMENT 2	**.70923**				.60021	.59235
MANAGEMENT 3	**.79763**				.61711	.71592
MANAGEMENT 4	**.66972**				.57755	.53147
MANAGEMENT 5	**.76274**					.63148
MANAGEMENT 6	**.80587**				.54278	.74158
MANAGEMENT 7	**.83599**				.58746	.77329
MANAGEMENT 8	**.71063**					.56247
MANAGEMENT 9	**.69532**				.60716	.57920
MANAGEMENT 10	**.77897**				.60490	.69692
PROGRAM 1			**.80935**			.68995
PROGRAM 2			**.81204**			.70185
PROGRAM 3			**.84596**			.74064
PROGRAM 4	.50255		**.79533**			.68649
PROGRAM 5	.51409		**.74627**			.62725
PROGRAM 6			**.64776**			.46721
PROGRAM 7			**.60229**			.37530
PROGRAM 8			**.78402**			.65214
PROGRAM 9			**.52353**			.31162
PROGRAM 10			**.77381**			.62666
Eigenvalues	19.55	4.83	3.15	2.53	1.44	

Primary factor loadings are in boldface. Cross-factor loadings equal to or greater than .50 are included.

Table 4

Intercorrelation Matrix of the Variables for Study I

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Job Safety	31.94	9.17	(91)										
2. Co-worker Safety	35.18	7.64	47**	(91)									
3. Supervisor Safety	33.16	9.42	33**	62**	(95)								
4. Management Safety Practices	31.43	9.17	42**	63**	82**	(95)							
5. Satisfaction with the Safety Program	36.72	7.43	38**	57**	74**	80**	(93)						
6. Reported Accidents	.82	.73	-26**	-31**	-22**	-24**	-16**	(-)					
7. Unreported Accidents	.35	.78	-24**	-33**	-28**	-31**	-29**	48**	(-)				
8. Near Accidents	.75	1.30	-34**	-32**	-32**	-35**	-32**	38**	52**	(-)			
9. Age	39.17	10.04	01	-08	07	09*	05	-19**	-13**	-09	(-)		
10. Gender	--	--	28**	02	01	-01	03	-03	00	-07	-05	(-)	
11. White Collar	--	--	-35**	-07	02	-03	-12*	09*	-04	11*	02	-51**	(-)

Note. N = 301 to 710. Decimal points omitted. Reliability (internal consistency) estimates located in the diagonal. Accident variables represent the square root of the self-reported accidents. Gender (1 = Male; 2 = Female); White Collar (1 = White collar; 2 = Blue collar).

* $p < .05$, ** $p < .01$.

Table 5

Stepwise Regression Analyses Predicting Accidents Variables for Study I

Criterion	Variable(s) entered[a]	Model ΔR^2	Model F	p
Reported Accidents	STEP 1	.04	7.96	< .01
	Co-worker Safety	.09	40.06	< .01
	Job Safety	.02	7.62	< .01
Unreported Accidents	STEP 1	.02	3.51	< .05
	Co-worker Safety	.10	44.62	< .01
	Program Safety	.02	7.18	< .05
Near Accidents	STEP 1	.01	1.95	> .05
	Management Safety	.12	40.25	< .01
	Job Safety	.04	13.60	< .01

[a] STEP 1 includes the following variables: age and gender.

Table 6

Items for the Compliance with Safety Behaviors Scale and their Item-total Correlations for Study II

Items	Corrected Item-total Correlations
1. Overlook safety procedures in order to get my job done more quickly	.41
2. Follow all safety procedures regardless of the situation I am in	.64
3. Handle all situations as if there is a possibility of having an accident	.59
4. Wear safety equipment required by practice	.59
5. Keep my work area clean	.60
6. Encourage coworkers to be safe	.65
7. Keep my work equipment in safe working condition	.63
8. Take shortcuts to safe working behaviors in order to get the job done faster	.37
9. Do not follow safety rules that I think are unnecessary	.24
10. Report safety problems to my supervisor when I see safety problems	.61
11. Correct safety problems to ensure accidents will not occur	.65

Table 7

Demographic Characteristics of Sample in Study II

Variable	Categories	Values
Gender:	Male	56.4%
	Female	43.6%
Age:	Mean	41 years
	Minimum	17 years
	Maximum	70 years
Educational Level:	Less than junior high school	1.7%
	Completed junior high school	1.2%
	Some high school	7.6%
	Completed high school	30.4%
	Some college	41.1%
	Completed college	13.3%
	Graduate school	4.7%
Occupation:	White	50.8%
	Blue	49.2%

Table 8

Intercorrelation Matrix of the Study Variables for Study II

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Job Safety	32.89	9.34	(92)														
2. Co-worker Safety	35.97	7.84	45**	(89)													
3. Supervisor Safety	33.12	10.31	28**	54**	(96)												
4. Management Safety Practices	32.53	9.87	41**	53**	82**	(95)											
5. Satisfaction with the Safety Program	36.27	8.10	29**	49**	63**	71**	(92)										
6. Reported Accidents	.79	.72	-18**	-03	-04	-06	00	(-)									
7. Unreported Accidents	.22	.61	-19**	-16**	-18**	-22**	-14*	26**	(-)								
8. Near Accidents	.57	1.02	-35**	-24**	-24**	-30**	-15**	24**	44**	(-)							
9. Compliance with Safety Behaviors	4.22	0.67	17**	29**	36**	35**	29**	-05	-19**	-24**	(85)						
10. Physical Complaints	2.99	2.83	-24**	-20**	-14**	-19**	-15**	-02	04	22	-09**	(81)					
11. GHQ-12	2.50	0.46	-21**	-20**	-24**	-25**	-19**	01	06	18**	-11**	39**	(83)				
12. Sleep Complaints	2.37	0.60	-13**	-18**	-13**	-16**	-15**	-11*	-01	07	-05	54**	35**	(77)			
13. White Collar	----	----	-38**	-11*	-00	-04	-03	01	-01	14**	-08*	-06	02	-03	(-)		
14. Job Stress	6.31	2.11	-29**	-24**	-27**	-26**	-20**	07	06	15**	-12**	21**	18**	19**	-10**	(-)	
15. Job Satisfaction	6.64	2.45	30**	25**	37**	41**	31**	-08	-0E	-24**	26**	-22**	-22**	-18**	-01	-24**	(-)

Note. N = 297 to 826. Decimal points omitted. Reliability (internal consistency) estimates located in the diagonal. Accident variables represent the square root of the self-reported accidents.

* $p < .05$, ** $p < .01$.

Table 9

Stepwise Regression Analyses Predicting Accidents and Compliance with Safety Behaviors for Study II

Criterion	Variable(s) entered[a]	Model ΔR^2	Model F	p
Reported Accidents	STEP 1	.02	1.13	–
	Job Safety	.02	4.24	< .05
Unreported Accidents	STEP 1	.03	2.08	–
	Management Safety	.02	4.62	< .05
Near Accidents	STEP 1	.11	6.85	< .01
	Job Safety	.04	11.09	< .01
	Management Safety	.02	3.96	< .05
	Supervisor Safety	.02	4.85	< .05
Compliance With Safety Behaviors	STEP 1	.09	9.34	< .01
	Supervisor Safety	.06	26.46	< .01
	Co-worker Safety	.01	6.78	< .01

[a] STEP 1 includes the following variables: age and gender, job satisfaction, and job stress.