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Occupational Stress, Safety, and Health: Conceptual Framework and Principles for Effective Prevention Interventions

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The authors present an overarching conceptual model of occupational stress, safety, and health, incorporating multiple factors from diverse disciplines. They examine specific implications of the model for the development of prevention interventions (e.g., context-specific interventions and primary, secondary, and tertiary prevention). They review prevention interventions and describe and analyze 4 case studies that address exposure to environmental, ergonomic, and psychosocial stressors and a combination of physical–environmental and psychosocial stressors. The authors examine lessons learned from these interventions in light of the conceptual model (e.g., role of top management and integrating research and intervention).

During the past decade there have been an increasing number of publications addressing interventions aimed at preventing work-related illness and injury and promoting employee health. The focus of these publications has included (a) the development of conceptual models to guide worksite stress and social health programs (e.g., Baker, Israel, & Schurman, 1996; Gottlieb & McLeroy, 1994; Heaney & van Ryn, 1990; Israel & Schurman, 1990; Ivancevich, Matteson, Freedman, & Phillips, 1990; Karasek, 1992; Quick, Murphy, Hurrell, & Orman, 1992), (b) an examination of approaches for the prevention of work-related psychological disorders (e.g., Quick et al., 1992; Sauter, Murphy, & Hurrell, 1990) as well as approaches for addressing health at work more broadly (e.g., Ilgen, 1990), (c) a review of stress management interventions (e.g., Murphy, 1984, 1995), (d) an assessment of studies aimed at preventing and reducing stress at work (e.g., DiMartino, 1992; Landsbergis & Cahill, 1994; Landsbergis et al., 1993; Schurman & Israel, 1995), and (e) an examination of occupational safety and health interventions (e.g., Goldenhar & Schulte, 1994).

While the overall aim of this literature is similar, to gain increased knowledge and understanding of effective interventions for promoting employee health and preventing work-related illness and injury, the diversity of perspectives and fields has for the most part evolved independently and with little overlap. For example, the target of change (e.g., individual and organization), the intervention strategy (e.g., job redesign and stress management), and the proposed outcomes (e.g., reduced stress and improved safety) differ considerably across these fields. Thus, it is not uncommon within a single organization to have separate interventions developed by staff from different disciplinary backgrounds, for example, industrial–organizational psychology, occupational health and safety, health promotion–education, and clinical psychology and health psychology. The result has been the proliferation of programs that are fragmented from one another that may, on the one hand, focus solely on individual behavior change (e.g., use of protective clothing and psychological counseling) with little consideration of the broader

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organizational context or focus on changing the organization with little attention paid to individual employee differences. Recognizing the limitations of such a compartmentalized approach to workplace health, there has been a call for more comprehensive interventions that integrate these multiple dimensions and perspectives (Baker et al., in press; Corey & Wolf, 1992; Heaney & van Ryn, 1990; Ilgen, 1990; Ivancevich et al., 1990; Karasek, 1994; Israel, Schurman, & House, 1989; Wallerstein & Weinger, 1992).

Specifically within the field of psychology, there has been a criticism of both the worksite health programs that focus predominately on the individual and on tertiary prevention (Barone, 1995; Corey & Wolf, 1992; Ivancevich et al., 1990; Murphy, 1984; Murphy & Hurrell, 1987a; Quick et al., 1992) and the emphasis in organizational development programs on productivity and profit at the exclusion of health-related issues (Ilgen, 1990). Numerous psychologists have called for a blending of approaches traditionally used by industrial-organizational, clinical, and health psychologists (Corey & Wolf, 1992; Ilgen, 1990). In recent years there have been several examples in which this blending has begun to take place. For example, the 1990, 1992, and 1995 occupational stress conferences were cosponsored by the National Institute for Occupational Safety and Health (NIOSH) and the American Psychological Association (Quick et al., 1992; Keita, Sauter, Gowing, & Fox, 1995; Murphy, Hurrell, Sauter, & Keita, 1995). These in turn led to the development of a postdoctoral program in occupational health psychology and the *Journal of Occupational Health Psychology* (Quick, 1996).

To develop a more broad-based approach to improving health and preventing disease and injury in the workplace, an overarching conceptual model of work and health is needed. Such a model needs to facilitate the blending of approaches by incorporating the factors that the diverse disciplines have been concerned with and to provide general guidelines for the development, implementation, and evaluation of comprehensive worksite health programs. The purpose of this article is to provide such a framework that builds on the model of the stress process developed at the University of Michigan (French & Kahn, 1962; House, 1981; Israel & Schurman, 1990; Katz & Kahn, 1978) and to examine its applications. In this article we present a comprehensive model of work and health, discuss implications of the model and principles of practice for the development of prevention interventions, describe and critique illustrative examples of prevention interventions (categorized along four broad types of exposure, that is, to environmental stressors, to ergonomic stressors, to psychosocial stressors, and to a combination of physical-environmental and psychosocial stressors) in light of the comprehensive model, cite additional examples of worksite prevention interventions, and examine lessons learned from these interventions with implications and principles for occupational health psychology practice.

Comprehensive Model of Occupational Stress and Health

A comprehensive model of occupational stress and health developed at the University of Michigan Institute for Social Research (French & Kahn, 1962; House, 1981; Israel & Schurman, 1990; Katz & Kahn, 1978) provides a useful framework for understanding the diverse factors and complex relationships associated with work and health. In accordance with this model, occupational stress is seen as a complex and dynamic process in which stressors, perceived stress, short-term responses, and modifying factors all affect each other and long-term health outcomes (Figure 1). This model is substantiated by considerable research evidence (Baker, 1993; Baker, Israel, Schurman, & House, in press; Cooper & Marshall, 1976; House, 1981; Hurrell, 1987; Israel, House, Schurman, Heaney, & Mero, 1989; Levi, 1972).

As depicted in Figure 1, employees experience objective conditions that are part of the psychosocial and physical environment. These conditions are referred to as *stressors* if they are likely to be perceived as harmful, threatening, or bothersome (Lazarus & Folkman, 1984) or if they place a demand on employees that results in a physiological adaptational response (Selye, 1982). Stressors may include major life events, daily hassles, chronic strains, ambient environment, and cataclysmic events (Israel & Schurman, 1990). Major life events are discrete events that occur and disrupt or threaten to disrupt normal activities, such as death of a coworker on the job. Daily hassles are the ongoing minor events that may be perceived as bothersome, for example, meeting deadlines. Chronic strains are the problems and challenges that people experience over time, such as ongoing work overload or sex discrimination. Ambient stressors are the continuous conditions that exist in the physical environment, such as exposure to noise or hazardous materials. Cataclysmic events are sudden disasters that necessitate major adaptive responses, for example, toxic spills.

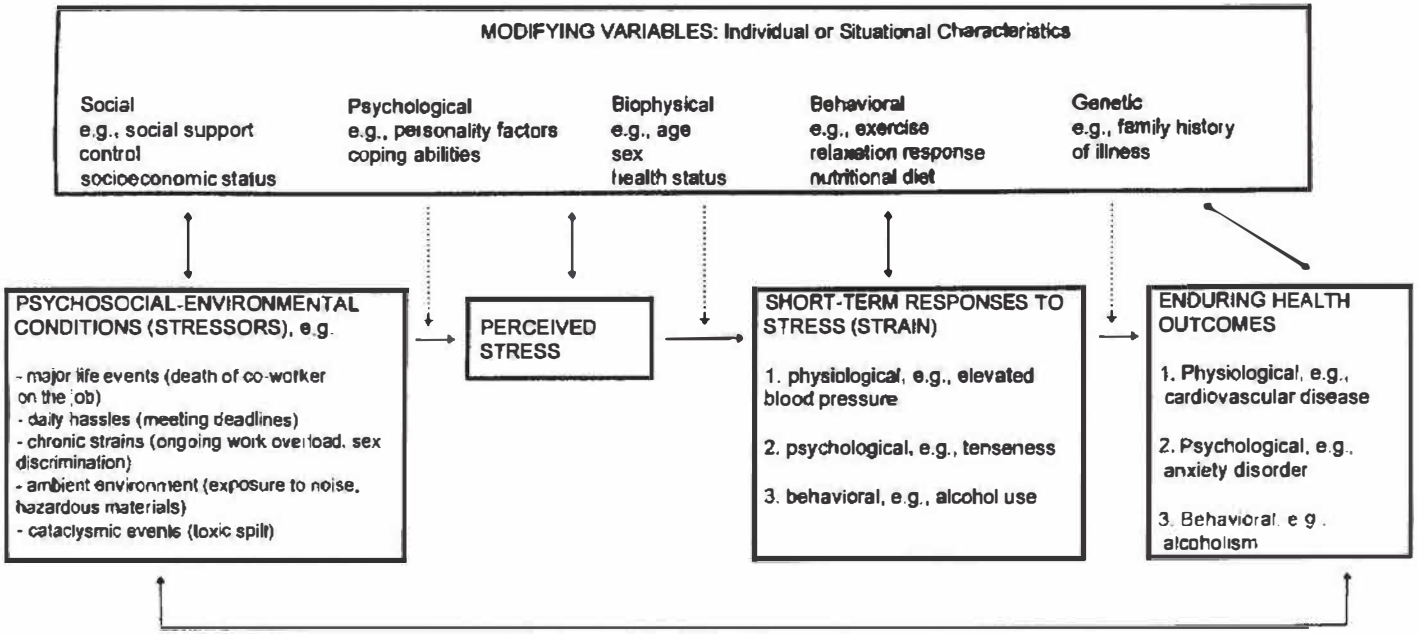

Figure 1. Conceptual framework of the stress process (French & Kahn, 1962; House, 1981; Israel, Schurman, & House, 1989; Israel & Schurman, 1990; Katz & Kahn, 1978). Solid lines between boxes indicate presumed relationships among variables. Dotted lines indicate the hypothesized buffering effects of the modifying variables on the relationship between stressors and perceived stressors, between perceived stress and short-term responses, and between short-term responses and enduring health outcomes. From Figure 1 of "Action Research on Occupational Stress: Involving Workers as Researchers," by B. A. Israel, S. J. Schurman, and J. S. House, 1989, p. 137. Copyright 1989 by Baywood Publishing Co. Adapted with permission.

These stressors do not necessarily result in negative outcomes; rather their effects depend in part on the extent to which the stressors are perceived as stressful by the people involved. In addition, the short-term responses to perceived stress may vary and include the following reactions: physiological (elevated blood pressure), psychological (tenseness), and behavioral (alcohol use, exercise, and use of protective equipment). In situations in which perceived stress and short-term responses continue over time, they may affect enduring health outcomes, such as cardiovascular disease, anxiety disorder, or alcoholism. Finally, there are a number of modifying factors that may directly affect any of these components or the relationship of these components to each other. As a result of the interplay among these factors, no objective stressor is likely to have the same effect on everyone exposed to it; rather, certain individual or situational factors modify how an individual experiences the stress process (categorized in Figure 1 according to social, psychological, biophysical, behavioral, and genetic variables).

As indicated by the two-way arrows and feedback loops in Figure 1, this model reflects a complex and dynamic process. For example, while stressors may have a direct effect on perceived stress, which in turn may have a direct effect on short-term and then long-term health outcomes, objective stressors may also have a direct effect on enduring health outcomes. Also, although social support, a modifying variable, may have a direct impact on short-term responses to stress, one's short-term responses may affect the nature and extent of social relationships. Furthermore, social support may buffer the relationships between perceived stress and short-term responses. There are other important relationships between and among the five elements that are not depicted in Figure 1. These include the potential mediating effects that the modifying variables may have on each other, the relationship between stressors in different life domains (e.g., work and family), and the potential positive effects that can occur throughout the stress process (see Israel & Schurman, 1990, for a more detailed discussion). Finally, the model as presented here focuses on the effects of the stress process on the individual. The stress model is also applicable at group, organization, community, and societal levels (Israel, Checkoway, Schulz, & Zimmerman, 1994). Thus, the existence of stressors within a workgroup and organization can be assessed along with their effect on such factors as social disintegration and organizational competence.

Implications of the Model for Prevention Interventions

This conceptual framework of the occupational stress process has numerous implications or principles of practice for the development, implementation, and evaluation of workplace interventions. (The implications described below draw on earlier work by Israel & Schurman, 1990; Israel, Schurman, & House, 1989; Israel et al., 1992; Schurman & Israel, 1995. Additional references that support these intervention guidelines are provided in the text.)

1. Context-specific interventions. The contextual nature of the stress process, combined with the differences in perception of stressors as stressful, suggests that interventions need to be context specific rather than relying on pre-packaged, context-independent programs. To understand the specific organizational context, the intervention process needs to involve employees in the development and implementation of learning activities in order to incorporate their knowledge of the context into the development of appropriate interventions. A critical component then is the assessment of stress and needs within a given organization and tailoring an intervention to these accordingly (Gottlieb & McLeroy, 1994; Wallerstein & Weinger, 1992).

2. Comprehensive approach to prevention interventions. To address the complex set of factors in the stress model, a comprehensive approach to prevention interventions is needed, in which multiple types of interventions are aimed at different levels of practice, for example, individual, work group, department, and organization (Ivancevich et al., 1990; Karasek, 1994; Murphy, Hurrell, & Quick, 1992; Sauter et al., 1990). Such an approach is consistent with an ecological framework that recognizes that individuals are embedded within social networks (e.g., families and friends), which are embedded within organizations (e.g., work places, churches, and schools), which are in turn subsystems of communities and then society, suggesting that a comprehensive intervention needs to be targeted at each of these five levels (i.e., intrapersonal, interpersonal, organizational, community, and public policy) and needs to recognize that the potential effects of intervening at one level also have effects on other levels (Gottlieb & McLeroy, 1994). (Such an ecological framework is consistent with an earlier biopsychosocial model of medicine [Engel, 1977, 1980] that was in turn based on a general systems theory perspective [von Bertalanffy, 1952, 1968].)

3. Primary, secondary, and tertiary prevention.

The multiple types of interventions involved in such a comprehensive approach can be aimed at factors within each of the five elements of the model and encompass primary, secondary, and tertiary prevention (Ivancevich et al., 1990; Karasek, 1992; Quick et al., 1992; Quick & Quick, 1984). Thus, programs targeted at reducing the physical-environmental and psychosocial conditions conducive to stress, as well as programs aimed at strengthening the modifying variables such as social support, coping abilities, and control, are examples of primary prevention interventions; that is, with the goal of reducing the potential risk factor or altering the nature of the stressor before employees begin to experience stress-related symptoms (Quick et al., 1992). Programs targeted at individuals already experiencing negative short-term responses to stress are examples of secondary prevention interventions. While these programs often entail changing the ways in which individuals respond to the stressors, they can also focus on changing the physical or psychosocial environment to reduce stress-related symptoms (Quick et al., 1992). Finally, programs directed at treating individuals with enduring negative health outcomes are examples of tertiary prevention interventions; that is, with the goal to heal those who have suffered long-term negative effects associated with work (Quick et al., 1992).

4. Different types of stressors. The conceptual model suggests the value of recognizing and addressing the different types of stressors within the work place (e.g., physical-environmental and psychosocial) and the relationships between them (e.g., ergonomic risk factors and little control over work; Kuhn & Wooding, 1994; Landsbergis & Cahill, 1994; Sauter et al., 1990). It is important that attention to one type of stressor not be given at the expense of another, rather, as suggested above, an assessment needs to be made within a given organization of a broad array of stressors and the extent to which they are perceived as stressful.

5. Objective conditions. While, as indicated above, it is critical to assess subjective perceptions of stress, it is also important to examine objective conditions in the workplace (Murphy et al., 1992). As portrayed in the conceptual model, such objective conditions may have a direct effect on health irrespective of perceived stress.

6. Multiple outcomes. Given that the stress process may result in negative physiological, psychological, or behavioral outcomes for the employee, as well as negative outcomes on the organization (e.g., productivity and profitability), it is necessary that intervention design take this into consideration and that the effects of an intervention be evaluated on multiple outcomes rather than solely focusing on one disease category.

7. Collective action and broad-scale change. Interventions need to include collective action aimed at organizational and social change to reduce those stressors that are beyond any one individual's ability to control (e.g., ethnic discrimination) in order to achieve lasting and significant change in health and quality of life.

8. Participants' involvement and control. Interventions that obtain the participants' active involvement in and control over program planning, implementation, and evaluation have the potential to be health enhancing in and of themselves.

9. Multidisciplinary teams. Given the complexity of the conceptual model, and the implications outlined above for a comprehensive approach to prevention interventions in work environments, multidisciplinary teams of researchers and practitioners are needed to carry out effectively such an approach.

Prevention Interventions: Literature Review and Case Examples

To provide a greater understanding of the strategies and issues involved in applying the stress model to worksite interventions, we present four illustrative case studies with brief references to additional interventions. The in-depth cases were selected on the following criteria: interventions that were comprehensive and integrated several aspects of the stress model (e.g., intervened at multiple levels within the organization and focus of change both on reducing stressors and on strengthening modifying factors), interventions that had an emphasis on primary and secondary prevention, the interventions could be examined in light of the stress model even if the intervention was not originally conceptualized as such (e.g., an ergonomics intervention), program examples that were drawn from different areas within the occupational health arena (e.g., exposure to physical-environmental stressors, psychosocial stressors, and a combination of physical and psychosocial stressors), and interventions in which the description and results were available in the published literature. Potential cases that were excluded from this review were organizational development and change interventions such as quality of worklife (Kolodny & van Beinum, 1983) and total quality management (Lawler, Mohrman, & Ledford, 1992), given their focus

primarily on "business" outcomes rather than on health, and collective bargaining and policy–legislative approaches, given the already broad scope of the present article and the recent excellent reviews of such approaches (see Landsbergis et al., 1993; Landsbergis & Cahill, 1994).

The following case studies and additional intervention examples cited are categorized along four broad types of exposure: to environmental stressors, to ergonomic stressors, to psychosocial stressors, and to a combination of physical–environmental and psychosocial stressors. The typology used here to categorize interventions is consistent with the conceptual model of stress and health (Figure 1), is intended to include the major areas within the diverse occupational health arena, and is not seen as a set of totally independent categories. To the extent that the information was available, the case studies presented include a brief description of the organization; the nature of the work and workforce; the goals and objectives of the intervention; the nature of the problem–stressors and assessment strategies used; the planning and implementation of the intervention strategies; the organization structure and staffing; the role of and relationship between outside researchers–consultants, employees, management and the union; the evaluation design and methods used; and the intervention results, including project strengths and accomplishments as well as limitations and barriers encountered. Each of the cases is critiqued with respect to the conceptual model of the stress process, for example, the extent to which the intervention adhered to the guidelines presented earlier. Finally, the article concludes with a discussion of lessons learned across the cases and the implications for occupational health psychology.

Interventions Focused on Exposure to Environmental Stressors: Review

Prevention interventions traditionally carried out within the occupational safety and health field can be categorized in a number of ways (see, for example, Goldenhar & Schulte, 1994). For this article, such intervention examples are categorized according to the type of occupational exposure the intervention is designed to reduce or eliminate: (a) environmental, that is, chemical, physical (nonergonomic), and biological stressors and (b) physical–ergonomic stressors (presented in the *Exposure to Ergonomics Stressors* section). (For a more thorough review of intervention studies designed to reduce or eliminate occupational exposures see Goldenhar and Schulte, 1994.) To date, few of these interventions address more than one type of environmental exposure, use more than one type of intervention, or target more than one level of change (e.g., organizational, departmental, and individual). Examples of several of these interventions, as well as some that are broader in focus, are cited below. Following this brief review, a case study is discussed in more depth that exemplifies a more comprehensive approach to occupational health and safety prevention, whereby multiple levels of the organization are targeted for change, more than one type of intervention is designed and implemented to deal with a specific problem in which the goal of the intervention includes multiple rather than single outcomes.

Exposure to Hazardous Chemicals

Interventions designed to reduce employee exposures to chemicals, solvents, and other agents (e.g., lead) vary widely. For example, hospital workers' exposure to ethylene oxide (EtO) has been addressed by implementing both engineering solutions to limit the source of the exposure (i.e., retrofitting equipment such as fans and sensors; Kerchner & Mortimer, 1987) as well as conducting training sessions designed to increase worker awareness of EtO hazards and methods to reduce personal exposure (LaMontagne, Kelsey, Ryan, & Christiani, 1992). Rubber gloves, rubber boots, and socks have been evaluated as interventions to reduce tobacco farmers' exposure to hazardous levels of nicotine while harvesting tobacco (Ghosh, Gokani, Doctor, Parikh, & Kashyap, 1991). Increasing worker knowledge about specific hazards and prevention-related behaviors has been used to reduce worker lead intake (Holness & Nethercott, 1988; Porru et al., 1993) and to educate farmers about the hazards of working in confined spaces (Ferguson et al., 1989). Finally, interventions involving workers in increasing their knowledge and problem-solving capacities for addressing exposure to a number of different hazardous substances have been examined in a special issue of the *American Journal of Industrial Medicine* (Wallerstein & Weinger, 1992).

Exposure to Physical (Nonergonomic) Stressors

Loud and continuous noise is a physical stressor for many employees. Interventions designed to reduce noise exposure have focused on changing employees' behavior, changing the environment, and changing policies. Intervention research study examples include attempting to increase firefighters' awareness of

the hazards of noise so that they will begin wearing hearing protection on the job (Ewigman, Kivlahan, Hosokawa, & Horman, 1990), engineering an enclosed and insulated container to protect sawmill workers from excessive noise exposure (Fairfax, 1989), and instituting strategies such as rotating shifts (Fairfax, 1989) and supervisor and management training (Harrison, 1989) designed to limit employee exposure to noise during the workday.

Exposure to Hazardous Biological Agents

Exposure to biological hazards has been targeted by using a variety of intervention techniques. These interventions focus primarily on hospital workers and include the implementation of interventions such as using hole-sensing gloves to reduce exposure to bodily fluids (Hamer, 1992), reducing needlestick injuries by using new sharps disposal boxes, and educating health care workers to recap needles (Sellick, Hazamy, & Mylotte, 1991). Another intervention involves training health care workers in a train-the-trainer program to increase knowledge and understanding about HIV-AIDS transmission and prevention strategies (Askari & Mehring, 1992).

Intervention to Reduce Exposure to Hazardous Biological Agents: Case Study

Study Site, Study Sample, and Goals and Objectives of the Project

This comprehensive intervention project was conducted in a 450-bed acute care community hospital (part of a nine-hospital network) in the eastern United States (Gershon, Conrad, Karkashian, & Revicki, 1995; Gershon, Karkashian, Walshe, & Vickers, 1995). It began when the newly appointed head of the safety committee hired a university researcher-consultant to help him attain his, and the hospital's, goal of developing a "first class safety program." The impetus for the request was prompted, in part, by (a) the hospital's awareness of a need to improve the overall safety program to limit liability and costs and (b) a desire on the part of the senior-most management to rate highly on an upcoming hospital review of plant management and technology indicators.

Nature of the Problem

After an assessment by the researcher-consultant, several problems were identified within the hospital's Safety Committee, including lack of goals and structure, lack of participation, and employee disbelief of management commitment to safety and health. A joint decision was made between the consultant and the vice-president for Patient Support Services that employee participation and influence were key for developing a fully operational safety program. To begin the process, the Safety Committee was revived by bringing in new members, including managers from some of the largest hospital departments, and the committee was chaired by a hospital vice president, which demonstrated management's level of commitment (see Figure 2, Boxes A, B, and C). The committee worked as a group to develop the goals and objectives for the coming year, and according to the consultant, a sense of shared mission was accomplished.

Intervention Strategies

To stimulate employee interest in safety, a large safety campaign was launched. The first step entailed facility-wide mandatory safety training for all personnel (even the chief executive officer attended). This was followed by a well-publicized Safety Fair, where prizes, samples of safety equipment (e.g., different types of gloves for skin sensitivity), and refreshments were given to employees. Many members of the Safety Committee were involved in planning and implementing the fair, which enabled hospital employees to meet many of the committee members. At the same time, the hospital's safety manual was completely revised. The revision process involved Safety Committee members as well as employees from outside of the committee. The new manual was used at a series of mandatory management training sessions in which managers learned their responsibilities with respect to safety at the hospital.

As stated earlier, the Safety Committee was revived by bringing in new people. Additionally, some structure was introduced to the committee by forming five major subcommittees (see Figure 2, Box C). These five subcommittees were created to investigate a variety of identified health and safety concerns: hazard surveillance, waste and hazardous waste, infection control, accident reporting and investigation, and effectiveness review. The subcommittees met monthly, rigorously collected and reviewed data, and brought their findings to the larger committee for review and discussion. Every member of the overall Safety Committee participated in one of the subcommittees. On the basis of the findings reported by the subcommittees, several key task

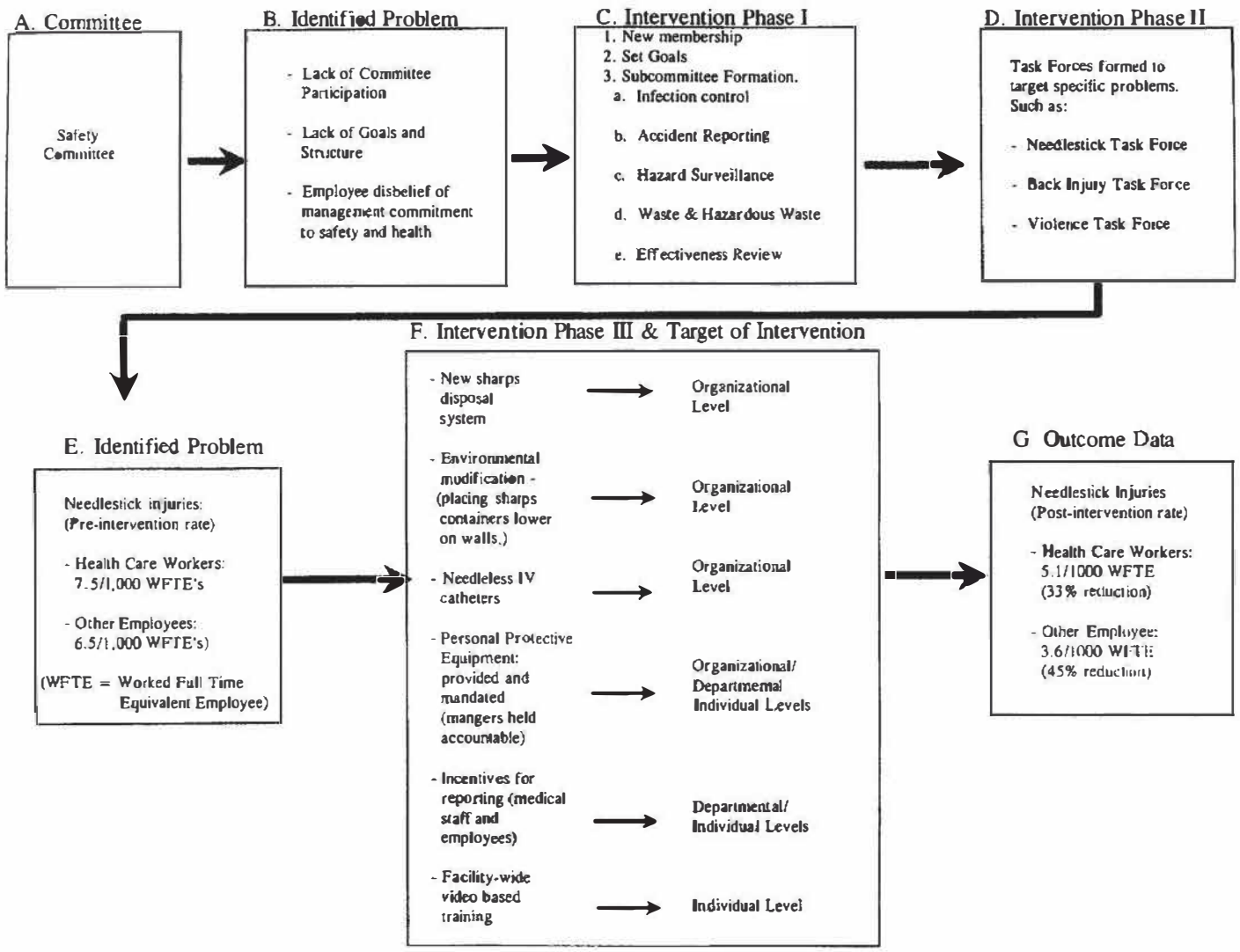

Figure 2. The intervention process at the safety committee level. IV = intravenous.

forces were formed and given the mandate of implementing solutions to specific problem areas, that is, needlestick injuries, back injuries, and violence (see Figure 2, Box D). The remainder of this case study discussion focuses on the Needlestick Task Force and the effectiveness of its interventions.

The Needlestick Task Force determined that there were numerous needlestick injuries at the hospital (see Figure 2, Box E). Before the intervention, there were 7.5 needlesticks per 1,000 WFTEs (worked full-time equivalents) for health care workers and 6.5 per 1,000 WFTEs for all employees other than health care workers. To address this problem, the task force recommended and implemented a comprehensive approach that involved a number of interventions and targeted multiple levels of the organization (see Figure 2, Box F). At the organizational level, four interventions were implemented including introducing a new sharps disposal system, making environmental modifications, instituting needleless intravenous catheters, and providing and mandating use of adequate personal protective equipment (PPE; i.e., gloves). Additionally, individual workers and departments were held responsible for reducing needlestick injuries by wearing the proper PPE, following universal precaution procedures, and establishing incentive programs for reporting needlesticks injuries.

Organizational Structure–Staffing

The consultant recognized that the employees who knew and understood the problems at the worksite had to be involved in developing and implementing the solutions and had to be given some authority and resources to make a significant difference in health and safety (this was a nonunionized hospital). (The consultant's, and ultimately the hospital's, basic philosophy was that managers needed to be trained effectively so they could train people in their own department.) Therefore, members of the Safety Committee and other noncommittee members with expertise in particular subjects (e.g., electrical safety) were asked to participate in a management (i.e., train-the-trainer) training program. The consultant helped to organize and facilitate the training of managers. She also intensively trained security staff on how to conduct environmental hazard assessments. Although the consultant clearly brought some level of expertise to the situation, the consultant's primary role was to be a catalyst to help motivate and energize the Safety Committee.

Evaluation Design and Results: Accomplishments and Barriers

Both process and outcome data were and still are being collected. Departmental safety task forces were established to evaluate the effectiveness of the overall safety program. Members of these task forces spoke to workers to find out if they believed that the safety program was working in their departments. They also looked at quantitative data such as workers' compensation data, needlestick data, and accident reports. Findings from these data indicated that in some cases the safety program was not working. That is, in some departments, there was still a low level of compliance with safe work practices, and the overall injury rates were not declining. Through this data collection process, the task forces determined that managers needed a greater level of understanding of how to minimize employee risk, and they also needed more training on how to share this knowledge with their staff. As a result of this evaluation, new training modules were prepared, and more manager training was conducted. The training was designed to make managers more aware of their responsibilities with respect to safety and make them more accountable for their role in the safety of their employees.

With respect to needlestick injuries, the postintervention (1-year intervention) sharps rate went down for both health care workers and other employees (5.1/1000 WFTE and 3.6/1,000 WFTE, respectively, see Figure 2, Box G). This is approximately a 24% decrease in needlestick injuries. The most dramatic decreases were seen in the critical care and emergency departments.

In addition, survey items were analyzed from an annual quality of worklife questionnaire that measured employees' intentions to practice universal precautions. Findings from the survey showed that, compared with employees in other hospitals in the hospital system, the study's hospital employees had the highest level of intention to practice universal precautions ($M = 3.97$ on a 1-4 scale).

A major barrier faced by the researcher-consultant was manager resistance, which included lack of support from some departmental managers as well as a more pervasive antipathy toward the safety initiative. At first, the managers stated that they did not want to be responsible for safety in their departments and indicated that there was too much to do and too much to know. The consultant said that she had to push hard as well as practice "handholding" through the whole process (Gershon, Conrad, et al., 1995; Gershon, Karkashian, et al., 1995). However, 4

years later, management is saying they want to publish the findings and get the word out regarding the effectiveness of their efforts (Gershon, Conrad, et al., 1995; Gershon, Karkashian, et al., 1995). Thus, a key component to making the program work was the support of the managers. The consultant also pointed out that one of the reasons for the program's success was that the multifaceted program was able to accomplish the goals and meet the expectations of many of the people involved in the process who had different goals and measures of success.

Critique of the Intervention With Respect to the Stress Model

Although the case study was not conducted by using the stress model as a theoretical framework, it did incorporate a number of the model's implications for prevention interventions. Most notably, both the overall intervention program and the needlestick intervention program were comprehensive in nature. That is, a number of solutions were identified and implemented for remedying the problems (e.g., new sharps disposal system, needleless intravenous catheters, and incentives for reporting needlesticks), and there were multiple targets for those solutions (i.e., individual, departmental and organization wide). The interventions did not consist of pre-packaged solutions to problems that were then imposed on the employees. Rather, from the beginning of the new safety program, subcommittees and task forces, made up of both labor and management, were responsible for gathering data to identify and assess the magnitude of the problems as well as for designing solutions to address those problems. This likely fostered a greater sense of control among the hospital employees with respect to health and safety in the hospital as well as an enhanced sense of social support for health and safety from the management (i.e., modifying factors).

The interventions were directed at addressing both primary and secondary prevention concerns. For example, with respect to the needlestick intervention programs, one goal was to reduce the potential for risk factor exposure (primary prevention). Furthermore, management wanted to ameliorate the identified stressful feelings of health care workers related to perceived lack of management commitment to safety, which was a secondary prevention effort.

With respect to the process, multidisciplinary teams, including the consultant as well as upstream (i.e., the generator of the needles: nurses and phlebotomists) and downstream (i.e., laundry and house keeping) workers, worked together to develop, implement, and evaluate the various aspects of the safety program.

Finally, multiple outcome measures were utilized to evaluate the effectiveness of the programs. With respect to evaluating the needlestick prevention interventions, quantitative data regarding the number of needlesticks were gathered from incident reports and, as reflected in Figure 2, the program was effective in reducing needlestick injuries. In addition, workers' compensation costs related to needlesticks were collected and evaluated, as were survey items from an annual quality of worklife questionnaire that measured employees' intentions to practice universal precautions.

Interventions Focused on Exposure to Ergonomic Stressors: Review

A second category of interventions focuses on reducing the effects of exposure to ergonomic stressors. To date, the majority of ergonomic interventions narrowly target modifications in tools and other equipment. For example, Armstrong, Kreutzberg, and Foulke (1982) studied the effects of redesigned knives for reducing the grip force required and forearm muscle fatigue on poultry workers. Wick (1987) found that new work station features (e.g., adjustable chairs, mounted armrests, and angled presses) provided to machine operators in a sandal factory reduced wrist deviation and compressive force on the L5/S1 disc from 85 to 13 pounds. While these types of interventions are important and often produce positive results, recent evidence suggests the utility of a more comprehensive approach. For example, Kilbom (1988) reviewed 14 studies of ergonomic interventions aimed at reducing work-related neck and upper limb disorders and concluded that job redesign is the most effective approach, but as the physical environment improves, work organization and psychosocial factors become more important. Wands and Yassi (1992) found that through active involvement in ergonomic assessments, educational programming, and feedback, laundry workers were able to show to management what types of ergonomic changes were needed.

Intervention Focused on Exposure to Ergonomic Stressors: Case Study

Intervention Goals and Design

Silverstein and her colleagues sought to take an ecological approach to the design and implementation

of an ergonomics intervention (Schurman, Silverstein, & Richards, 1994; Silverstein, Keyserling, Alscer, Richards, & Stetson, 1990; Silverstein, Richards, Alscer, & Schurman, 1991). The intervention design reflected a growing understanding that large-scale health and safety interventions cannot be implemented in isolation of the larger organizational context in which they are introduced and that interventions need be linked to the strategic decision-making level of the company and union (e.g., Hugentobler, Robins, & Schurman, 1990).

In the 1984 round of collective bargaining, the United Automobile, Aerospace and Agricultural Implement Workers (UAW) and the General Motors Corporation (GM) established a joint union–management task force to study ergonomic problems within GM facilities and to develop an intervention approach. The task force included three UAW health and safety representatives, three GM managers (two engineers and one safety representative), and two ergonomic experts from outside the company (an occupational epidemiologist and an industrial engineer). The charge to the task force was to develop an ergonomic pilot project (EPP) that could (a) identify ergonomic health-related problems, (b) effectively make changes, (c) scientifically measure progress, (d) determine training needs, (e) develop an implementation strategy for the plants, and (f) institutionalize the program.

During the study phase of their work, the task force observed a variety of ergonomic interventions and discovered that expertise for assessing ergonomic risks was concentrated in experts with little authority within the organization (usually engineering or health and safety departments) while top managers, subject to high levels of turnover, retained the power to actually make recommended changes. The predictable result was a failure to fully implement ergonomic improvements that often involved relatively simple changes that could easily be made by shop floor workers and their supervisors, if they were given the authority to do so.

Strategy, Structure, Staffing, and Context

On the basis of their assessment of the weakness of conventional approaches to ergonomics interventions, the task force proposed a "bottom-up" approach. Front-line workers designated as *ergonomic monitors* (EMs), trained and empowered to implement basic ergonomic improvements in their work areas, would be the primary agents of change. The overall intervention design was aimed at creating the necessary governance structure and education and training resources to support the EMs and included the following staffing and committee roles and responsibilities.

> *Ergonomic monitors (EMs)* were hourly employees democratically elected by their coworkers. EMs' responsibilities included ergonomic surveillance in their work area including collecting baseline and postchange data, working as a team with their front-line supervisor to implement simple job improvement, and providing feedback to their coworkers about EPP progress.
>
> *Department ergonomic committees (DECs)* were made up of EM–supervisor teams, maintenance and engineering support staff, the union representative, and the general supervisor of the area. DECs served as resource personnel to assist the EMs with problems that required more complex analyses or interventions, to prioritize ergonomic job changes, and to assess the effectiveness of the interventions. Complex changes might involve, for example, work organization, flowlines, multiple jobs, or major engineering changes.
>
> *Plant ergonomic committees (PECs)* were made up of plant policy makers (union leaders and management) and medical, engineering, health and safety, and manufacturing representatives. PEC responsibilities included overseeing the implementation process, addressing complex improvements that could not be solved at the departmental level, prioritizing ergonomic problems within the plant, and addressing general policy issues.
>
> *Plant ergonomic coordinators (ECs)* were full-time project staff appointed by union and management trained as in-plant ergonomic expert consultants. ECs' responsibilities included training, troubleshooting, and coordinating the implementation throughout the plant, as well as documenting all project activities.

The proposed design was a significant departure from GM's traditional top-down organizational culture, and there was some skepticism among task force members that it would be approved. The task force's recommended intervention design was accepted with one important exception. The criteria proposed for selecting the location for the pilot project and for selecting the ECs were ignored, and both were chosen largely for reasons of management expedience or union politics. This turned out to have important implications for the intervention.

In April 1986, five GM facilities, employing 18,000 people in Michigan, were selected to be study sites: two component parts warehouses, one engine and one stamping plant, and a newly renovated assembly plant. Ten departments within these facilities were selected to represent a variety of different jobs with different ergonomic characteristics.

Roles and Relationships

In December 1986, a multidisciplinary team of outside consultants including an occupational physician, occupational epidemiologist, two industrial engineers, and several labor educators were contracted to develop the necessary training for implementing and evaluating the EPP design. Three different ergonomics curricula were developed: an intermediate program aimed at PEC and DEC members, an introductory program for EMs and supervisors, and a 30-min "awareness" program intended to introduce all employees to the EPP and the importance of ergonomics in the design of work environments. In addition, a train-the-trainer program was developed to prepare ECs for their role as in-house ergonomics experts and trainers.

Evaluation Design and Results: Accomplishments and Barriers

Intervention evaluation included (a) the feasibility of developing ergonomic expertise in front-line employees (e.g., Can front-line workers acquire the necessary competence to reduce ergonomic risks? Is the train-the-trainer program a viable means to enable workers to learn to conduct basic surveillance and change activities?); (b) the effects of the EPP intervention, if any, on such organizational factors as product quality and productivity; and (c) the effectiveness of the governance structure and resources (e.g., Did the proposed structure serve its purpose of supporting shop-floor change? Were the assessment tools developed for use by the EPP staff workable?). Detailed discussions of both the evaluation methods and results are available elsewhere (Schurman et al., 1994; Silverstein et al., 1990; Silverstein et al., 1991), only major highlights are presented here.

Performance evaluation of the EMs and ECs coordinators. Performance evaluation focused on three areas: (a) trainee satisfaction with the training, (b) changes in trainee knowledge of ergonomics as a result of training, and (c) trainee performance on job assessment tasks by using the basic jobs checklist (BJC). The results showed that front-line employees could develop sufficient ergonomic expertise to reduce significantly ergonomic risk factors in their work environments. For example, the majority of employees in both the EM and the EC roles mastered the technical aspects of their roles. EM performance on basic assessment and surveillance tasks compared favorably with university experts' independent analyses. Also, EMs trained by ECs and other in-plant trainers showed no significant performance differences from those trained by university instructors.

Evaluation of ergonomic risk factors. Quantitative data showed that physical exams on 416 individuals at the beginning and end of the project revealed a significant reduction in low-back disorders (from 14.2% to 9.6%, $p < .03$) as well as a small but statistically significant decrease in metabolic expenditures. Additionally, both the symptoms questionnaires administered by the ECs and the physical exam data were correlated with BJC-identified risk factors for both the upper extremity and torso postures. As expected, in several departments (where adequate data were available) there were also significant decreases in scrap rates or absenteeism.

Evaluation of the organizational structure and support components of the intervention. The success in the technical domain was not matched in the organizational structure and support components of the intervention. Implementation of the EPP structure was evaluated through pre- and postquestionnaires and in-depth interviews with EPP participants to obtain their assessment of how the project had performed compared with their expectations. In addition, university staff observed a sample of PEC and DEC meetings throughout the project, recorded verbatim field notes of the meeting discussions, and asked participants to fill out questionnaires evaluating dimensions of meeting group processes, overall meeting satisfaction, and overall project satisfaction.

This data indicated the most important limitation of the intervention was the PECs' failure to fulfill their role in the governance structure. Despite the fact that 9 out of 10 facilities did initially establish a PEC, none managed to develop the participation of all the specified roles or positions—especially medical staff and union officials—and only 1 continued to meet and its meetings were infrequent. The DECs also had difficulty attracting the regular participation of people occupying the stipulated roles, particularly the department supervisors and union representatives. However, the DEC level of the structure was relatively successful in that all targeted departments did establish DECs, and most of these did carry out their function in the job change process.

Barriers. As might be expected, the intervention's overall success was hampered by the failure to attract the attention of top union and management officials on the PEC. This not only meant that there was no forum for overall leadership and for problem solving at the facility level, but it also sent clear signals to other managers and employees that the project was not a priority. In part, the failure of the

PEC can be attributed to changes in the context. Shortly after the project began, a slump in auto sales triggered production cut-backs and layoffs in the EPP facilities. Midway through the project the assembly plant was closed. These events negatively affected both the intervention implementation process as well as the evaluation. The reductions in personnel substantially reduced the number of people available, which made it difficult for EMs to perform their ergonomic surveillance activities.

The effects of the larger contextual and structural factors were most evident at EM and EC levels. First, not all supervisory areas selected EMs, resulting in fewer EMs than the project design had proposed. Second, there was considerable turnover among EMs: Of the original 42, only 19 EMs participated for the duration of the project. Third, although some EMs left the project because they were transferred to a different department or were laid off, many others resigned out of frustration at what they perceived as a lack of organizational support.

In addition to their frustrations with perceived lack of tangible support from the company and the union, some members of the EMs and ECs also developed resentment toward the university evaluation team. In part this stemmed from their role as data collectors for the evaluation that they believed took valuable time from more important intervention activities. They were also frustrated by the university team's role once the training phase was over. During the training, members of the university team served as valuable sources of expertise, feedback, and support and they developed close working relationships, especially with the ECs. Once the evaluation phase began, however, the quasiexperimental research design procedures dictated "noninterference" by the researchers. In addition, the evaluation research design was ambitious and required the collection of massive amounts of data to detect differences in work methods, health status, and organizational processes in a 3-year time period. These factors lead to conflicts between the research team and the in-plant project staff. Tensions also developed among members of the research team between those who favored a more active interventionist orientation in the action research or process evaluation traditions and those who focused exclusively on outcomes and insisted on adhering to the original research protocol.

Critique of the Intervention With Respect to the Stress Model

As stated earlier, this intervention was designed by using an ecological framework similar, though not identical, to the stress model. It was systemic in that multiple levels of the system were targeted for inclusion, and considerable attention was paid to identifying the appropriate roles and responsibilities of various individuals and groups to support the intervention process. Intervention components ranged from targeting individual behavior change related to ergonomic risks to job, organizational, and technical changes in the work environment to broader organizational changes in governance intended to support an ongoing commitment to reduce ergonomic-related injury.

From the perspective of the stress model, one contribution of this case is to reinforce the need to include the larger organizational context, beyond the local plant and union level, to emphasize the importance of the intervention to busy local managers and union officials. The role of corporate and national union officials in creating the conditions for local change is critical (see Hugentobler et al., 1990, for a fuller discussion). While these mechanisms were there during the EPP, they proved inadequate. On the basis of the results of the EPP, however, GM and the UAW strengthened this aspect of their corporate-side ergonomics program before diffusion.

Another lesson from this case, viewed from the stress model, is the importance of anticipating the psychosocial tensions likely to accompany an intervention of this complexity and magnitude. Though the ergonomic training curriculum did include a unit on managing change, it was not sufficient. Much of the stress was created by perceptions of inadequate support from the company and the union and could have been reduced by improving that aspect of the intervention. However, because psychosocial and physical factors may interact to create additional health risks, incorporating an explicit stress reduction–prevention component presents an opportunity to "leverage" intervention resources as well as to enhance the likelihood of successful implementation.

Interventions Focused on Psychosocial Stressors: Review

A third category of interventions focuses on reducing the effects of exposure to psychosocial stressors. Many of the descriptive studies in the occupational stress literature have identified prevalent psychosocial stressors such as role overload, assuming responsibility for the work, well-being, or both of others, ambiguity, and conflict (Caplan, Cobb, French, Van Harrison, & Pinneau, 1975; Holt, 1993; Kahn & Byossiere, 1992). Employees in various

occupations and organizational contexts may experience these common prevalent stressors as well as stressors more unique to their situations.

Strategies for reducing the adverse effects of psychosocial stressors include interventions at various points in the stress process. The first type of intervention focuses on identifying and reducing exposure to potent psychosocial worksite stressors either through expert-driven assessments and modifications (Karasek, 1992) or through participatory processes during which employees identify psychosocial stressors and develop and implement plans for reducing them (Israel et al., 1992; Landsbergis & Vivona-Vaughan, 1995; Schurman & Israel, 1995). Such interventions are the least common of all stress reduction interventions (Ivancevich et al., 1990); however, the few that have been developed were implemented in various occupational settings (e.g., public service agencies, manufacturing plants, and health care organizations) and addressed a wide array of stressors, for example, inadequate communication between organizational units and levels, conflict between supervisors and subordinates, ambiguity about job responsibilities and priorities, and lack of autonomy on the job (Cahill, 1992; Israel et al., 1992; Landsbergis & Vivona-Vaughan, 1995; Schaubroeck, Ganster, & Sime, 1993; Schurman & Israel, 1995).

The second type of intervention attempts to enhance personal resources for increasing individuals' capacity to cope with or handle psychosocial stressors, usually through educational and skill-building efforts (e.g., Freedy & Hobfall, 1994; Kline & Snow, 1994; Meichenbaum, 1993). These cognitive–behavioral interventions help employees acquire a broad repertoire of coping skills, including stressor recognition, cognitive restructuring, problem solving, and interpersonal skills for handling disagreements and conflicts. (For a review of occupational stress management techniques see Murphy, 1995.)

The third category includes those strategies that enhance social resources such as social support and influence in workplace decision making to enhance employees' abilities to resolve and handle psychosocial stressors (e.g., Jackson, 1983; Kuhn, 1992; Mayes, Sime, & Ganster, 1982). These interventions often provide increased opportunities for employee input into decisions (e.g., by conducting work team meetings) and attempt to increase the extent to which the organizational climate facilitates employee participation in decision making.

The most common type of worksite stress intervention focuses on developing personal strategies for alleviating stress-related symptoms. Relaxation techniques, biofeedback, and exercise are examples of strategies in this category (Jex, Spector, Gudanowski, & Newman, 1995; McGuigan, 1993; Murphy & Hurrell, 1987b; Stoyva & Budzynski, 1993). Finally, strategies can target points of intervention near the end of the stress process by identifying and initiating early treatment for employees exhibiting behavioral, psychological, or physical strains that are due to psychosocial stress (Colantonio, 1989; Walker & Martin, 1983).

Intervention Focused on Psychosocial Stressors: Case Study

Setting, Problem Identification, and Intervention Objectives

The intervention described below, called the *Caregiver Support Program* (CSP), was designed to meet the following objectives: (a) to teach employees about the helping potential of support systems and to build skills in mobilizing available support from others at work and (b) to teach employees about participatory problem-solving approaches and to build skills in implementing such approaches in work team meetings (Heaney, Price, & Rafferty, 1995a, 1995b). The human service workers who participated in the CSP were managers and direct care staff in group homes that provided residential care for adults with developmental disabilities or mental illness. During the program development process, semistructured interviews were conducted with a sample of these employees. These interviews indicated that although client care (with its inherent unpredictability and unrelenting demand for careful attention and creativity) was noted to be stressful, negative interactions with coworkers, supervisors, and other mental health professionals were most often cited as potent stressors. In addition, the employees perceived that they had much responsibility for client care but little input into the planning of client programs. Thus, the CSP was intended to reduce exposure to these stressors and to maximize employees' abilities to cope with other nonmodifiable stressors by increasing the social support and control available to the caregivers on their jobs.

Intervention Strategies

The CSP involved six training sessions conducted over a 9-week period. The Appendix summarizes the content of the sessions. The sessions were conducted in groups, with each group consisting of the house

manager and one direct care staff person from 10 group homes. The participants were expected to learn new CSP concepts and skills for themselves, as well as to learn how to train other staff who did not have the opportunity to participate in the CSP training sessions. In addition, the managers (with the assistance of the direct care staff who attended the CSP) were expected to incorporate participatory group problem solving into their group home decision-making processes.

The CSP training sessions incorporated active learning processes such as modeling and rehearsal of newly learned skills. In addition, much of the prescriptive content was developed by the participants themselves. Although skill areas were chosen on the basis of prior research and the qualitative needs assessment, actual strategies for improvement were generated through participant brainstorming and the sharing of stories illustrating successful responses to stressors. For example, through a brainstorming activity, participants explored how social support from others might help solve problems and reduce distress. They generated a list of specific ways that others might aid in dealing with common job stressors (e.g., dealing with aggressive clients; Heaney, 1991).

Roles and Responsibilities

The CSP was developed by an interdisciplinary research team composed of university researchers trained in organizational psychology, public health, and social work as well as by administrators and researchers from the public mental health system. Facilitators of the training groups were hired specifically for the project and were chosen on the basis of their experience with small group processes and their familiarity with the caregiving professions.

Evaluation Design and Results

The CSP was evaluated through a field experiment in which group homes were randomized into the intervention or control group. Data were collected from all group home employees through the use of self-administered questionnaires 1 month before the beginning of the training program and 5 weeks after the CSP ended. The questionnaires included measures of various work-related attitudes and behaviors, social support and social undermining, participatory problem-solving processes, and employee mental health and well-being.

Major results indicated that the CSP was effective at increasing perceived social support, interpersonal skills, group problem solving, positive work team functioning, job satisfaction, and employee mental health among those employees who attended at least five of the six CSP sessions. Interpersonal stressors (e.g., negative interactions with supervisors) were reduced for this same group of employees. The train-the-trainer aspect of the program was found to be much less effective. At the last CSP training session, one third of the participants reported that they had not yet conducted any training activities back at their group homes. According to the survey results, employees in the intervention group homes who did not personally attend CSP sessions did not benefit from the program (Heaney et al., 1995a, 1995b).

Critique of the Intervention With Respect to the Stress Model

The CSP represents a good first step in the development of a stress reduction program that attempts to enhance the psychosocial resources of social support and participation and influence in decision making. It demonstrates that an approach emphasizing individual skills training and the modification of small group problem-solving processes can be effective in enhancing these resources. However, the CSP also has several weaknesses that would need to be addressed if it were to serve as a basis for future worksite stress reduction efforts.

First, including more of a focus on reducing major stressors identified by the participants could enhance the effectiveness of the CSP. Preventive interventions are more likely to be effective if they build on times of transition or the occurrence of major events during which people are more open to assessing their situations and modifying their responses (Institute of Medicine, 1994). Worksite programs that address chronic stressors often do not capitalize on these "windows of opportunity." The CSP is no exception; indeed, after the initial qualitative assessment, the CSP did not emphasize the identification and modification of prevalent stressors other than negative interactions with others at work, nor did it address major transitions at work (e.g., changes in regulation policy and client transitions into or out of the home). This lack of tailoring the intervention to the needs of the employees may have diminished employees' perceptions of the usefulness or applicability of the program as well as diminished their motivation to learn and implement new skills and procedures.

Second, paying more attention to the potential

modifying effects of the larger organizational context of the group homes might have strengthened the program. The CSP assumed that the group homes operated as semiautonomous units. However, the behavior and policy decisions of house managers were likely to be influenced by the reward structures and culture of the nonprofit agencies that employed them (House, 1981). These agencies were encouraged by the CSP staff to support the goals of the program but were given no specific guidelines on how to do so.

Third, the CSP provided little assistance to caregivers in terms of the alleviation or management of adverse short-term responses to stress. When preventive interventions are conducted in high-stress occupations, some participants are likely to desire this type of assistance. When individually focused stress management strategies are implemented as part of a comprehensive program, they may be beneficial in reducing stress-related symptoms and in revitalizing personal coping resources.

Interventions Focused on Physical and Psychosocial Stressors: Review

Many researchers in the field of ergonomics have examined the relationship between psychosocial factors and musculoskeletal disease (see Bongers & de Winter, 1992, for a review). A recent review of the literature examining the relationship between these factors found

> that monotonous work, high perceived workload and time pressure are related to musculoskeletal symptoms. In addition, the data suggest that low control on the job and lack of social support by colleagues are positively associated with musculoskeletal disease. Perceived stress may be an intermediate in this process. In addition, stress symptoms are often associated with musculoskeletal disease, and some studies indicate that stress symptoms contribute to the development of this disease. (Bongers, de Winter, Kompier, & Hildebrandt, 1993, p. 297)

While there is a significant body of literature that suggests that psychosocial factors are related to musculoskeletal disease (e.g., Arnick & Smith, 1992; Bernard, Sauter, Fine, Petersen, & Hales, 1992; Bongers et al., 1993; Carayon, 1993; Faucett & Rempel, 1994; Houtman, Bongers, Smulders, & Kompier, 1994), there are few interventions that explicitly attend to the interplay among these factors, that is, use more comprehensive models to guide interventions. Interventions that have taken a more comprehensive approach (addressing ergonomic and psychosocial factors) include those conducted by labor unions (e.g., Communications Workers of America [CWA] and UAW) and interventions resulting from joint labor–management efforts (Cahill, 1992; Cahill & Feldman, 1993; Landsbergis, Silverman, Barrett, & Schnall, 1992). To illustrate the variety of programs that exist, we describe several of these briefly and one program, a study conducted in a child welfare agency in New Jersey, in more depth.

The CWA program was initiated in response to concerns of high absenteeism and lost work time because of physical illness and high stress levels in the communications industry. A health hazard evaluation conducted by NIOSH found that musculoskeletal disorders were associated with "fear of being replaced by computers, jobs which required a variety of tasks, increasing work pressure, lack of production standard, lack of job diversity with little decision making opportunity, high informational processing demands, and surges in workload" (U.S. Department of Health and Human Services [USDHHS], 1992, p. 3). The severity of these disorders was associated with these factors plus "uncertainty about one's job future, lack of co-worker support, and lack of supervisor support" (USDHHS, 1992, p. 3). The study concluded that the psychosocial work environment is related to the occurrence of work-related upper extremity musculoskeletal disorders and upper extremity musculoskeletal symptoms." The CWA train-the-trainer program was designed to address these concerns by redesigning the office by using a "total ergonomic perspective" (D. Legrande, personal communication, June 1995). This entailed the purchase of new ergonomically correct equipment as well as initiating a self-managed office. The self-managed office involved working with union officials, union members, and company officials to increase joint decision making within the office. Productivity increases and decreases in injury rates were attributed to program activities.

Another example of this type of program is the video display terminal (VDT) coalition, formed by a university-based labor education program and a group of unions. The VDT coalition began as the result of worker concerns about the introduction of video display terminals and subsequent health problems (Baker, Stock, & Szudy, 1992). The coalition activities included conducting surveys of union members, petitioning for a NIOSH health hazard evaluation, establishing a resource center, and publishing a quarterly newsletter. Their program also included activities to enhance workers' control by

providing workers with the opportunity to share strategies for creating changes in their workplace and bringing people together to provide knowledge and skills to influence legislative protection policies for VDT operators (Baker et al., 1992). In addition, the coalition worked with operators to teach them about VDT hazards and to design better VDT workstations.

The UAW District 65 Member Assistance Program is another illustration of a program focused on both physical and psychosocial stressors. This program was established to address the sources of stress in the workplace and focused specifically on female and Hispanic workers. Stress committees were formed at a number of worksites to "provide support, stress management information, identification and documentation of stressors, and forums for developing strategies for action (including group grievances, development of contract language and meeting and negotiating with management)" (Landsbergis et al., 1992, p. 147). Ergonomic conditions were viewed as one of several stressors in the work environment. In response to these stressors, members of the local Stress Committee joined with members of other local stress committees and others to establish a health and safety committee to address common hazards. Overall, the work of the Stress Committee resulted in a number of changes, including convincing employers to make improvements in ergonomic conditions, such as changes in computer equipment (Landsbergis et al., 1992).

Intervention Focused on Physical and Psychosocial Stressors: Case Study

Organization Setting and Workforce

The study conducted by Cahill and colleagues exemplifies a comprehensive approach to addressing physical and psychosocial stressors in the workplace (see Cahill, 1992; Cahill & Feldman, 1993, for more details). The intervention was a joint labor–management project conducted within a public child protective agency in New Jersey. The agency employed approximately 4,000 individuals in 47 district offices and 1 central office. Clerical workers, social workers, supervisors, and managerial staff were included in the study. The social workers were responsible for large, often severe (involving sexual abuse, drugs, and alcohol) case loads. In addition to actual client contact, social workers were required to maintain extensive case information that needed to be shared with the central office while maintaining access to this information at the district office.

Nature of the Problem and Assessment Strategies

An internal agency review found that social workers were spending only 14% of their time in direct contact with clients and as much as 60% of their time on paperwork to track these cases (Cahill, 1992; Cahill & Feldman, 1993). While an information system had been developed to assist in tracking client information, the system had many shortcomings (e.g., required extensive knowledge of codes and lack of access to the information that was gathered). As a result, the information system created work overload for both the social workers and the clerical workers (Cahill, 1992).

In addition to this internal review, a survey was conducted by an outside researcher. The results of the survey indicated that agency employees reported higher levels of stress-related symptoms than a national sample of similar employees (Cahill, 1992). Social workers and clerical staff reported problems with access to information and data, use of the system of codes, ineffective reporting procedures, and repetitive jobs with little flexibility or use of skills. In addition, several ergonomic problems were identified such as "poor design of equipment, lighting, monitors and work flow" (p. 198, Cahill, 1992).

As a result of these assessments and labor–management concerns, a labor–management stress committee was formed. The committee was charged with addressing "morale and burnout problems in the agency" (p. 197, Cahill, 1992).

Description of Intervention Goals and Strategies

The first step in the development of the intervention was the formation of an agency-wide joint labor–management stress committee. This committee met with outside researchers to develop specific goals and priorities for the project. The project goals focused on strengthening psychosocial factors as well as reducing the sources of stress including

> increasing the amount of local autonomy and decision making latitude that the clerical staff had over the computer system, increasing skill levels of clerical staff, introducing the new system without increasing stress levels of the staff, implementing a career ladder, improving health and safety factors, including installation of ergonomically correct equipment, improving the job satisfaction of the clerical staff, streamlining information flow between the local and central office, and providing health and safety training to the clerical staff around the use of microcomputers. (p. 199, Cahill, 1992)

On the basis of these assessments, workers, management, and researchers worked together to develop, implement, and evaluate a number of interventions (e.g., development of computer programs, ergonomic changes, and stress management). A major focus of the intervention was to address the problems in the agency's information systems by designing new computer programs to meet the information needs of both the local district offices and the central office. A computer programmer was hired to begin program development and implementation in a pilot site. The consultant worked directly with local district office workers to ensure that the staff's identified needs were met. The researchers also observed the clerical workers and performed the same work-related tasks that they performed, using the information gained to develop several additional computer programs. Once developed and piloted at one district office, the programs were disseminated throughout the agency (Cahill, 1992). Moreover, several support systems were implemented to assist local district offices in using these new computer programs. For example, before dissemination of the computer programs, meetings were held with local district office employees to provide them with the opportunity to discuss the implementation process and their concerns. All employees were trained to use the new systems and had easy access to assistance if they had questions or concerns (Cahill, 1992; Cahill & Feldman, 1993).

In addition to the changes in the information systems of the agency, a health and safety ergonomic intervention was implemented (Cahill, 1992; Cahill & Feldman, 1993). This involved purchasing ergonomically correct computer equipment and workstations as well as developing a training program for clerical staff. The training addressed musculoskeletal disorders, eyestrain, and fatigue. Finally, the initial intervention included training to assist employees in developing stress management techniques (J. Cahill, personal communication, June 1995).

Program activities have continued since this initial intervention program and currently include skill development, supervisory training, and the adoption of additional computer programs and technology to enhance the quality of work life and control over the work process (J. Cahill, personal communication, June 1995). These additional programs are being offered in a smaller portion of the agency to provide greater program intensity (J. Cahill, personal communication, 1995).

Evaluation Design and Results: Accomplishments and Barriers

The intervention was evaluated through a pre–post intervention survey of all clerical staff in the agency. The evaluation results indicated that the intervention had a positive impact on

> decision latitude, created skill, attitude toward technology, and job satisfaction. Clerical staff who actively used the new microcomputers and related applications appeared to have more control over their jobs, felt their jobs required more skill, had a better attitude toward technology and were more satisfied. (p. 201, Cahill, 1992).

In addition to the survey, the researcher repeated the observation of clerical staff that had been done before the intervention. The comparison of these two observations showed improvements in both productivity and skill levels (Cahill, 1992).

These results indicate that the intervention was successful in accomplishing many of its goals. The researchers cited the joint labor–management approach, the computer consultant's reporting to the local district offices rather than the main office, and attention to psychosocial factors in the implementation of the project (e.g., explicitly addressing the stress created by technological change through education and support) as contributing to the success of the invervention (Cahill, 1992; Cahill & Feldman, 1993).

The researchers also noted a number of barriers that they encountered in implementing this program. One barrier was the challenge presented by working with both labor and management. In terms of labor, union involvement was seen as essential to the inception of the project. However, active union involvement was not possible throughout all project phases because union resources were directed toward other issues. There was some concern on the part of the researchers that this may have limited their capacity to influence and bring about certain types of changes (Cahill, 1992; J. Cahill, personal communication, June 1995). In terms of management, the researchers encountered strong support from some segments of management and mild-to-strong opposition from other members of management, particularly those responsible for information technology. The researchers were ultimately able to overcome this obstacle by including these managers in the change process.

The researchers also noted that they met with resistance to using a more comprehensive approach to addressing stress in the workplace. They indicated

that they met with little resistance to buying equipment but met greater resistance when requesting personnel time to train individuals in using the equipment and answer staff questions (Cahill & Feldman, 1993). Finally, the researchers noted that there were insufficient resources to evaluate adequately many components of the intervention, for example, the ergonomics and stress management components.

Critique of the Intervention With Respect to the Stress Model

Although not designed by using the conceptual framework of the stress process presented in this article, the intervention was consistent with the model in that it was comprehensive in terms of the multiple levels of the organization at which change was implemented, the targets of change, and the approach taken to develop and implement the changes. The intervention addressed psychosocial factors at both the local job level and the broader organizational policies and systems. The intervention also addressed physical ergonomic factors by intervening to change individual computers and workstations and individual behaviors (training to change behaviors to decrease eyestrain, musculoskeletal disorders and fatigue, and stress management techniques). Each of these interventions was viewed as complementing rather than substituting for the other intervention activities.

The intervention was also conducted in a way that acknowledged the impact of different elements in the stress model. The intervention was developed by a joint labor–management stress committee. In this way the process acknowledged the *organizational context* within which the intervention was to be implemented (one in which there were labor–management tensions that required that all parties be involved in any proposed changes). The committee itself also *enhanced members skills* in identifying problem areas and developing programs to address these problems. The intervention focused on changing *organizational policy* while at the same time encouraging *local autonomy and control* (modifying factors) in that the computer programs were developed on the basis of local needs and were developed to be flexible enough to meet the needs of different district offices (e.g., providing the option of entering different fields into the programs as needed) and the needs of the agency as a whole (Cahill, 1992). Finally, the intervention addressed *individual behaviors* in its focus on ergonomic and stress management training for employees (Cahill, 1992; J. Cahill, personal communication, June 1995).

The intervention also acknowledged, and explicitly addressed, the potential for creating stress through the introduction of technological change. This was done by holding meetings for staff to express their concerns about the upcoming changes. Moreover, once the initial changes were implemented the staff was provided with training on how to use the new programs and with ongoing and immediate response to any questions or concerns they might have. This led to an overall building of support for the new changes as staff saw the benefits of the new programs without experiencing added strain from the new technology (Cahill, 1992; Cahill & Feldman, 1993). It was also made clear to employees and their union that the benefits of the new technology would not be undermined by laying people off once the new systems enhanced the information flow, thus acknowledging workers' concerns regarding job security (Cahill & Feldman, 1993).

While the program was successful in meeting its stated goals, the researchers noted that continued assessment of issues and concerns and ongoing refinement of program activities are important, thus acknowledging the dynamic nature of occupational stress (Cahill & Feldman, 1993). The conceptual model presented in this article, and in previous work, suggests that one area that might be useful to assess would be coworker and supervisor support of social workers and clerical workers in general and as it relates to acceptance of technological change (Bongers & de Winter, 1992). This may be particularly important to assess as social workers increase the amount of time they spend in direct client contact. Should social support be found to be a significant factor, then interventions specifically aimed at strengthening supportive relationships at work might be appropriate (Heaney et al., 1995a, 1995b).

Lessons Learned and Implications for Occupational Health Psychology

The pattern of outcomes resulting from these interventions underscores the systemic nature of organizations and the complexity of the occupational stress process and reveals the promise of as well as the difficulties posed by a more comprehensive and ecological approach to prevention interventions in the workplace. In examining the findings across the four case studies, there are numerous lessons that can be learned (described below) that have implications for occupational health psychology specifically and the

occupational health and safety arena more broadly. (For additional discussion of relevant lessons derived from other studies and reviews see, for example, Baker et al., 1996; Israel et al., 1992; Karasek, 1992; Landsbergis & Cahill, 1994; Landsbergis et al., 1993; Landsbergis & Vivona-Vaughan, 1995; Schurman & Israel, 1995).

1. Conceptual framework of stress and health, a viable overarching model. The conceptual framework of the stress process presented here is a viable overarching model for facilitating intervention research across a broad array of occupational health and safety concerns. As several of the cases indicated, an effective approach includes intervening to reduce different types of stressors (physical-environmental and psychosocial), to strengthen modifying factors such as social support and control over decision making, and to provide skills and competencies for addressing short-term and long-term responses to the stress process. Furthermore, such an approach needs to be carried out at different levels of practice (e.g., individual, workgroup, and organization) by using different types of strategies. Hence, it is not enough to utilize individually focused strategies aimed at managing stress (e.g., exercise and relaxation) or treating individuals who have experienced the negative effects of the stress process (e.g., counseling). Rather, a more comprehensive approach is needed, one that considers the broader organizational context in adhering to some of the additional points suggested below.

2. Assessment of the factors in the stress model needs to be conducted at the local organization level. As indicated in these cases, a critical component of the intervention process is the assessment of needs and resources within the organization. Here again the stress model is useful in suggesting what factors need to be examined, for example, different types of stressors and modifying factors and responses. Through this assessment process, not only can programs be more appropriately tailored to the particular needs and situation of the worksite, but employees, managers, and unions (where present) gain a better understanding of the stress process and the role of not only individuals but the organization as a whole in reducing stressors and addressing stress-related problems.

3. Joint employee, union, and management committees, a key component. As several of the cases indicated, a key component of intervention success is the establishment, early in the process, of a joint committee comprising employees, union representatives, and management that has the responsibility and authority to identify health and safety needs and to develop strategies for addressing them. Such committees need to have the resources (financial and human), access to top leadership and decision making, necessary knowledge and skills, and the time required to effectively carry out their tasks. It is important to recognize the challenges associated with obtaining active, direct involvement of union and management representatives on such committees. Unions may feel their attention is needed to address other issues (e.g., downsizing and impending layoffs), and similarly management may be more concerned with business-related matters as well as be resistant to and threatened by change. Suggestions for overcoming these barriers include the selection on the part of union leaders of other union members to take an active role on such committees and report back to union officials; the assignment of committee membership as a part of managers' ongoing responsibilities, with other responsibilities being transferred to others in the organization; and the designation of front-line employees on such committees with the provision of time allowed outside of meetings to follow through on necessary tasks.

4. Role of top management and union representatives (where present) is crucial. Several of the cases showed that the "error of local determinism" (Katz & Kahn, 1978) continues to pose difficulties for organizational change interventions. What sometimes appear to be problems at the job or work-group level, and therefore amenable to locally controlled interventions, more often than not turn out to have implications for other parts of the system. Thus, while joint committees, such as those discussed above, are essential and small changes might be possible at, for example, the department level, without the support of top management and unions it is difficult to carry out and sustain broader, organization-wide changes. The importance of top-level management sponsorship and the role of the union as advocate is a consistent theme in the general literature on organizational change in unionized firms and in the narrower literature on joint union–management health and safety interventions (see Eaton & Nocerino, 1996, for a recent review of the empirical literature). The challenge remains in how to obtain the necessary leadership from the top. At a minimum, such leadership needs to be involved and their approval of the project at the beginning is necessary, and a mechanism needs to be established in which ongoing communication and support can be assured.

5. Train-the-trainer interventions can be an effective, albeit limited strategy. Several of the

cases included a train-the-trainer aspect to the intervention, in which employees were selected to receive specific types of training with the expectation that they in turn would provide similar training to others within the organization. This approach was quite effective in increasing the knowledge and skills of the trainers in a particular content area (e.g., assessment of ergonomic risk factors and strategies for strengthening psychosocial risk factors), but it had more limited success in the trainers being able to transfer their learning to others in the organization and in bringing about organizational changes. This speaks to the importance of a train-the-trainer intervention being part of a larger strategy that incorporates some of the other points discussed here (e.g., involvement of top management and union leaders).

6. Value of short-term, highly visible events and training. As seen in several of the cases, within the context of a comprehensive program, it is valuable to provide short-term, highly visible events (e.g., Safety Fair) as well as individual training (e.g., stress management). Given that system level changes occur over the long term, the inclusion of such short-term activities provides some immediate information and skills to a large number of employees and helps to inform employees of the longer range efforts that are taking place.

7. Which segments of the organization need to be involved in the change process needs to be considered. Although the cases presented here indicated the importance of joint health and safety committees and the role of top management and union leaders, it is not always clear when direct involvement is needed on the part of all affected or whether a representative approach to involvement is appropriate, nor is it clear when the intervention is most appropriately directed at an overall organization or some portion of it. In one instance, researchers indicated that local control over the development of programs was important to the success of the programs; in addition, for program activities to be of sufficient intensity to actually show change required that they focus on a smaller portion of the agency rather than intervene in the agency as a whole (Cahill, 1992; D. Cahill, personal communication, June 1995). Furthermore, it was suggested that it was not enough for only one person from a work group to participate in an intervention, rather all members needed to be involved for the desired changes to occur (Heaney et al., 1995a, 1995b). On the one hand, it may not be feasible for all members of a work group or department to participate in an intervention; on the other hand, the diffusion and transference of the learning process intended with a more representative approach may not easily be accomplished.

8. Organizational infrastructure needs to be established. As suggested above, to incorporate both top-down and bottom-up strategies, such comprehensive interventions require the establishment of an organizational infrastructure that can integrate the different system levels in the change process. Such a mechanism needs to provide enough structure to delineate clearly roles and responsibilities and to foster open communication and shared decision making, but it needs to be flexible enough that the structure itself does not overburden the participants and their ability to make decisions and bring about change.

9. Benefits and challenges of outside consultants and researchers. In the cases presented, the outside consultants–researchers–trainers were a key component to program success. It is critical that such outside "experts" consider themselves partners with members of the organization and recognize that everyone has expertise to contribute. Considerable time and attention needs to be given to the establishment of relationships on the basis of the norms of open communication, trust, and mutual respect. It is important that outsiders transfer needed skills to members of the organization so that they can continue the program after funding for it has ended. There are a number of challenges and potential conflicts associated with such collaboration, for example, regarding differences in goals, control issues, values, rewards, and incentives (see Israel et al., 1992, for a fuller discussion of these conflicts).

10. Integrating the research and intervention process. Several of these cases experienced the classic conflict between researchers and organization members on the basis of different goals, interests, and institutional constraints (Hochbaum & Lorig, 1992; Israel et al., 1992). More specifically, these conflicts related to the differences in emphases placed on the research or intervention component of the project. Recently, a growing number of organizational-change scholars from a variety of disciplines have advocated approaches to intervention that reduce the traditional segmentation of the intervention and research activities. Known variously as *joint inquiry* (Reason, 1988; Reason & Rowan, 1981), *action research*, or *participatory action research* (Elden & Chisholm, 1993; Israel et al., 1992; Whyte, 1991), this approach makes data collection and evaluation central to the intervention process. Researchers and outside experts contribute help in designing effective assessment and

evaluation methods and provide substantive expertise, but organization members participate directly in planning, conducting, and using evaluation data for the development of interventions. Such a participatory action research approach is most consistent with the stress model and comprehensive prevention strategy being suggested in this article.

11. Broader context has significant effects. As the cases described here indicated, and in keeping with an ecological approach, it is necessary to consider the potential effects of the broader context within which an intervention is taking place. While it may not be possible to do anything to affect situations such as economic recession, layoffs, and management turnover, it is important to be aware of these factors and their effects and attempt to incorporate them into the development, implementation, and evaluation of the intervention.

12. Multidisciplinary teams of researchers are advantageous. As suggested by the stress model itself, and as several of the cases presented in this article indicated, it is most advantageous to have a multidisciplinary team of researchers involved in such comprehensive interventions. Such an approach increases the likelihood that the needed expertise is available in such diverse areas as occupational health and safety, organizational change, health promotion, labor education, psychological counseling, psychosocial stress, and quantitative and qualitative methods. The numerous challenges associated with multidisciplinary efforts need to be recognized and addressed, for example, language differences, different value placed on intervention and research goals, and data collection and analysis methods. Here again, time needs to be allotted for team development and maintenance in order to carry out effectively the tasks required.

13. Closer links to other strategic changes taking place in the organization. Even when a prevention intervention is designed to be comprehensive, it often has difficulty avoiding the perception that it is a product of the management or union, or a health promotion or employee assistance function rather than a function of the organization as a whole. This creates the problem that the intervention is not really "owned" by the organization leaders and never becomes integrated with the strategic business and labor relations responsibilities that occupy these leaders' attention and for which they get rewarded. While there is mounting evidence that interventions aimed at reducing health and safety risks are highly consistent with interventions aimed at improving productivity and quality (e.g., Karasek & Theorell, 1990), there are few cases in which the two have explicitly been merged.

14. A long-term process of organizational learning and change is an important outcome. As depicted in these cases, it needs to be recognized during the early phases of a comprehensive intervention that a long-term structure and process for ongoing organizational learning from the intervention is required. Creating such a process is, in itself, one of the most important outcomes of the intervention and can serve as the basis for other organizational change interventions either targeted at health and safety improvements or other aspects of organizational functioning.

Conclusion

As discussed throughout this article, there are many examples of different types of prevention interventions in workplaces that are often fragmented and operate totally independently. It has been argued here that a conceptual framework of stress and health provides a useful overarching model for understanding and guiding the development, implementation, and evaluation of a more comprehensive approach to occupational health. As presented in the cases and lessons learned, there are numerous challenges in adopting this approach, such as, resources required, long time frame, obtaining active support of top management and union leaders, creating effective multidisciplinary teams both within and outside the organization, and integrating health-related programs into the overall operations of the organization. While not the explicit focus of this article, it is important to recognize that, to bring about such broader changes, efforts to affect legislation and policy are also essential. However, given the current political climate, it is perhaps even more important that comprehensive prevention interventions be developed and conducted at the local and corporate organizational levels. As such programs are conducted, the collection and analysis of data for the purposes of assessing organizational needs, addressing basic research questions, guiding the development of interventions, and evaluating interventions remains a critical component for justifying and sustaining this approach, as well as to influence policy decisions. The growing field of occupational health psychology has the potential to play a leadership role in bringing about the changes recommended in this article.

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Appendix

Caregiver Support Program Objectives and Content of Training Sessions

Session 1: Understanding Our Helping Networks

Participants will share the stresses of their caregiving jobs.
Participants will develop an understanding of what a network is and how network members can help them cope with their jobs.
Participants will map their own networks.
Participants will diagnose whether they are tapping the full helping potential of their networks.

Session 2: Strengthening Our Networks

Participants will learn how to better deal with conflict among network members.
Participants will develop skills in giving and receiving supportive and effective feedback.
Participants will learn how to gain cooperation and resources from others without straining relationships with network members.
Participants will generate strategies for lessening confusion, misunderstandings, and ambiguity in their networks.

Session 3: Becoming Effective Trainers

Participants will learn effective ways of eliciting and managing staff participation in meetings and training sessions.
Participants will develop a plan for training group home staff in one of the skills learned in Session 2.
Participants will rehearse portions of the planned training session and receive feedback from both trainers and other participants.
Participants will discuss possible setbacks that may occur when the training session is implemented in the home and "inoculate" themselves against them.

Session 4: Group Problem Solving 1

Participants will consider the advantages and disadvantages of using a participatory approach to decision making and problem solving.
Trainers will model the first two steps of a group problem-solving process that can be used with group home staff.
Participants will learn how to work together as a group to list out and prioritize the major problems in their group homes.

Session 5: Group Problem Solving 2

Trainers will model the next steps of the group problem-solving process.
Participants will learn how to work with their staffs to generate alternative solutions and to develop action plans for solving the problems.
Participants will develop plans for using the group problem-solving process back in their group homes.

Session 6: Maintaining New Skills and Occupational Self-Esteem Over the Long Run

Participants will understand why follow-up is important and will learn how to follow-up on their problem-solving plans.
Participants will share negative comments about caregiving jobs that they have heard and will discuss how best to deal with them.
Participants will graduate from the Caregiver Support Program.

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