

Participatory Ergonomics as a Model for Integrated Programs to Prevent Chronic Disease

Laura Punnett, ScD, Nicholas Warren, ScD, Robert Henning, PhD, Suzanne Nobrega, MS, Martin Cherniack, MD, and The CPH-NEW Research Team

Objective: To describe the value of participatory methods for achieving successful workplace health promotion (WHP) programming, and specifically the relevance of participatory ergonomics (PE) for the Total Worker Health (TWH) initiative. **Methods:** We review the concept of macroergonomics, and how PE is embedded within that framework, and its utility to modern WHP approaches such as “social health promotion.” We illustrate these constructs in practice within TWH. **Results and Conclusions:** Participatory ergonomics is relevant to WHP because (1) psychosocial stress contributes to individual health behaviors as well as chronic diseases; (2) job stress cannot be addressed without employee involvement in hazard identification and solutions; (3) the interaction of multiple levels within an organization requires attention to needs and constraints at all levels, just as the social-ecological model addresses higher-level determinants of and constraints on individual behaviors.

ERGONOMICS: THE FULL SCOPE OF THE DISCIPLINE

Ergonomics is sometimes framed, especially by those outside the field, in its narrowest interpretation, that of optimizing the physical dimensions of workstations, tools and equipment, lifting tasks, and static loads. Nevertheless, the discipline is not limited to those job-level considerations of physical task features, sometimes called “microergonomics” or “hardware ergonomics.” One standard definition of ergonomics, “fitting the work to the worker,” encompasses not only physical work demands but also mental demands, the social environment, psychological impact, and organizational features of the workplace.

In a work system, the various components—the workers as well as the hardware and the software—interact within an organization that needs to meet production and customer demands to remain economically viable. Thus, in its broadest conceptualization, attention to organizational and psychosocial issues is a fundamental and integral aspect of occupational ergonomics, not an “add-on” activity.

Ergonomists design work to support human limitations as well as to promote human capabilities, with attention to both the micro-level as well as the macro- or system-level features that define the job and impact the worker. The initial problem to be solved may be framed in terms of worker health and safety or system efficiency,

for example, the usability of a software system, but these are not mutually exclusive. Reducing errors might be motivated by concerns about injury to the operator or to others, or about system quality and productivity, but worker safety and comfort are always part of a good human factors design solution.

Increasing attention to the overlap among these goals, within the larger context of the organization, has led to development of the concept of “macroergonomics,”¹ referring to harmonization of the vertical interactions among the levels of the workplace (Fig. 1):

- Job physical factors, information processing, psychosocial factors
- Work organization (division of labor among jobs and workers, and between people and machines)
- Organizational structure, policies, climate, and culture

Macroergonomics requires the practitioner to evaluate and optimize user acceptability of technical or social workplace solutions within the larger context. Prevention of “job stress” is also a goal. Psychosocial stressors at work are defined slightly differently among investigators, but the fundamental concepts^{2–8} include the following:

- Low decision latitude or “job control,” meaning limited opportunity to decide how one carries out one’s own work or to participate in how the work is organized or scheduled. It may also coincide with low utilization of one’s skills or opportunity to learn new skills.
- High job demands, which refers to the overlapping domains of physical work pace and information processing. Key elements include a rapid work pace, few pauses, conflicting demands, and insufficient time to accomplish tasks well and without error. High job demands are more problematic when coupled with low job control (“job strain”) and/or low rewards.
- Low social support from coworkers and/or supervisor, referring both to affective relationships (getting along well with each other) and instrumental support, such as coworkers helping each other on the job and quality of supervision. Social support may buffer the adverse effects of job strain.
- Low rewards, relative to the effort required. These include both material rewards, such as salary and benefits, and intrinsic rewards of contributing to the overall mission and satisfaction with one’s own accomplishments.
- Perceived fairness in how different people are treated and how institutional rules and regulations are applied or enforced. Experiences of discrimination, incivility or harassment, and perceptions of how these are handled, are also relevant.
- “Emotional labor,” meaning the need to mask one’s true feelings or experiences to present a required appearance or to tend to other people’s needs.
- Job insecurity and/or instability related to the company’s economic position.

These psychosocial domains are not always clearly distinct from physical domains. One example is that rapid and repetitive work, which can be measured biomechanically in terms of cycles per hour of repeated hand motion patterns, may also entail a high pace of mental workload and/or produce psychological experience

From the Center for the Promotion of Health in the New England Workplace (Dr Punnett, Dr Warren, Dr Henning, Ms Nobrega, and Dr Cherniack), Lowell, Mass; University of Massachusetts Lowell (Dr Punnett, Ms Nobrega), Lowell, Mass; University of Connecticut Health Center (Dr Warren, Dr Cherniack), Farmington, Conn; and University of Connecticut (Dr Henning), Storrs, Conn. This work was supported by Grant Number U19-OH008857 from the National Institute for Occupational Safety and Health (NIOSH), US Centers for Disease Control and Prevention. The contents of this article are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH. None of the authors has any conflict of interest to declare in relation to this manuscript.

Address correspondence to: Laura Punnett, ScD, Center for the Promotion of Health in the New England Workplace, Department of Work Environment, University of Massachusetts Lowell, One University Avenue, Lowell, MA 01854 (Laura_Punnett@uml.edu).

Copyright © 2013 by American College of Occupational and Environmental Medicine

DOI: 10.1097/JOM.000000000000040

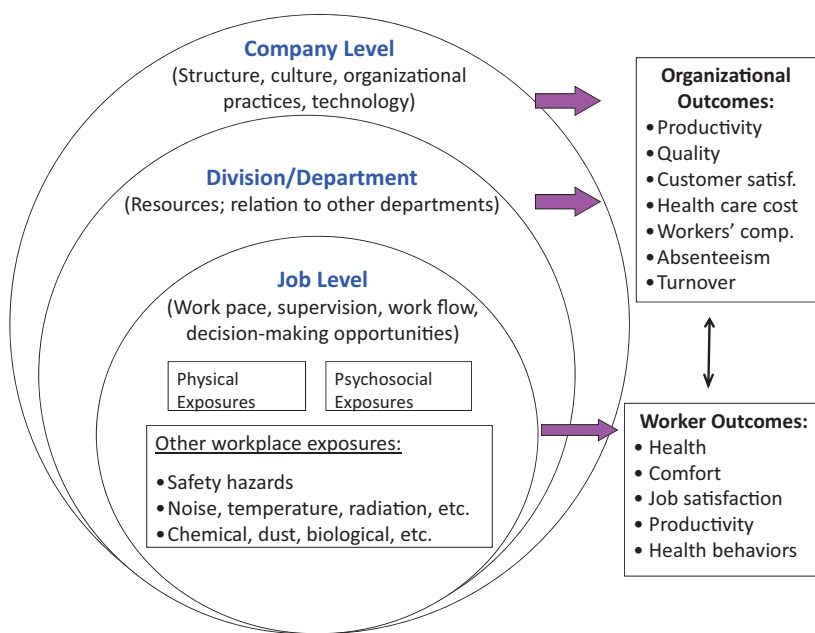


FIGURE 1. The workplace as a multilevel system.

of time pressure. Similarly, low job control is often accompanied by highly stereotyped physical work patterns.

Such correlations among physical, mental, and psychosocial job features do not occur at random.⁹ Many aspects of a job are determined by higher level decisions about how the work process is organized.¹⁰ These upper-level determinants are often key to understanding why physical and psychosocial stressors occur and especially to achieving healthy job redesign.

In the domain of occupational ergonomics and safety, as in other areas of occupational health, good design emphasizes engineering controls over administrative controls, which usually focus primarily on worker behavior. Engineering controls, in turn, are prioritized by the type of control achieved. Thus, an ergonomist may seek to improve the human factors of a job so that workers stressed by time pressure or distracted by multiple and conflicting demands are less likely to be injured—in other words, to achieve a *secondary prevention* goal.

A more effective approach is *primary prevention*, to prevent the stress itself, not merely to mitigate its effects. Excessive job demands, low job control, and other psychosocial job stressors are remediable.¹¹ An effective ergonomics program addresses the overarching work organization as it affects workers directly or indirectly, in addition to specific job-level physical and psychosocial risk factors (Fig. 1). “User-friendliness” is a core concept in human factors design, applied not only to software interfaces but also to the workplace as a whole. The range of comprehensive ergonomics program goals includes the following:

- Reduce occupational health and safety hazards
- Increase employee autonomy and decision-making opportunities
- Encourage participation and creativity in problem solving
- Structure healthier schedules
- Enhance interpersonal relationships at work
- Promote consistent and constructive feedback, fair recognition, and rewards for good work

THE VALUE OF A PARTICIPATORY APPROACH FOR TOTAL WORKER HEALTH

Another concept that has developed rapidly in the field of ergonomics recently is that of participatory ergonomics (PE), an intervention approach in which workers are involved in workplace, job,

and work organization redesign efforts. Participatory ergonomics follows in an integral way from the goals of macroergonomics.¹² To harmonize the needs of each level of the organization, input is needed from employees at all of those levels, and there must be genuine attention to that input. It is an iterative process that seeks active engagement of all stakeholders—and there is no group of stakeholders that has more at stake than the workers themselves.

It is argued here that a participatory process such as PE is highly relevant to success of the NIOSH Total Worker Health (TWH) program. Participatory ergonomics has its roots in an understanding that effective work redesign requires taking into account workers’ first-hand knowledge of their jobs, including the sources of variance in job demands and constraints.¹² Most of the goals listed earlier would not be achievable without worker involvement in problem identification, worker knowledge of what skills they bring to their jobs, and worker judgments about potential solutions. Employees can also factor in workplace social dynamics, their scheduling needs, and whether they feel fairly rewarded and recognized for their contributions.

The idea behind the concept of “Research-to-Practice” (R2P) is to translate scientific findings into usable guidance for another specific context. This poses a meta-level human factors problem: How does one translate proof of concept, best practices, etc, into a program that will work for a particular site? It becomes necessary for the users (workers) and the organization to play a role in this translation. Otherwise, the technical fix will not be properly implemented or sustained, no matter how much professional expertise goes into designing it.

Although PE can be a time-intensive process, its advantages include greater buy-in from all levels of an organization: avoidance of obstacles that are unforeseen by upper management, easier acceptance of input solicited from outside sources (eg, consultants), and better integration of programs with the workplace culture and needs of employees in different subgroups. Thus, it has a greater probability of leading to sustainable job changes.

Psychosocial stressors, such as low job control, high demands, and poor social support, are well-known to influence markedly our risk of disease and injury. It has recently been shown that these same factors, along with work organization features such as shift work and overtime, also influence individual “health behaviors” such as smoking, diet, and exercise patterns.^{13–18} These health behaviors are

already well-known as important risk factors for chronic diseases such as cardiovascular conditions, diabetes, mental health problems, musculoskeletal disorders, and others.

Many practitioners who are responsible for safety and health in the workplace are still not aware of the associations between psychosocial working conditions and health behaviors. Yet, ergonomics, if practiced in a comprehensive way, provides an opportunity to address the root causes of both work-related illness and injury and some of the root causes of poor health behavior. Even though health promotion per se is not a main goal of ergonomists, the TWH approach has broadened the occupational health outcome pallet to include improved health behaviors as well as more traditional improvements in system efficiency and worker health and safety. Attention to job stress, psychosocial characteristics of the job, and work organization represent the nexus between occupational safety and health (OSH) and workplace health promotion (WHP). Ergonomists who fully understand the concept of “fitting the work to the worker” have thus been addressing some of the root causes of health behaviors for years, often perhaps without realizing it.

CPH-NEW: PARTICIPATORY ERGONOMICS APPLIED TO INTEGRATED WORKPLACE PROGRAMMING

The Center for the Promotion of Health in the New England Workplace (CPH-NEW), one of the TWH Centers of Excellence, has developed a model for integration of OSH with WHP that is firmly based in a participatory approach. Just as an ergonomics program will likely not succeed long-term without genuine worker engagement, a WHP program also needs the same inputs. In fact, we have argued that the need for worker leadership in WHP priority setting and intervention design efforts is even greater.¹⁹

The WHP concept is fundamentally about supporting individuals in making healthier lifestyle choices. A WHP program that does not recognize workers as decision makers in this process will not be optimally effective. Furthermore, to the extent that a WHP program is imposed in a top-down manner without fully adapting to the conditions of people's daily lives, it may increase the experience of low decision latitude, rather than rectify it. Even if it seems efficacious in the short-term, such an approach could actually interfere with the conditions needed to achieve sustainable behavior change, in complete contradiction to the desired outcomes.

Framing health promotion in terms of healthy decision making implies that a program's process is as important as its content. In other words, the process itself needs to be part of the solution. Workplace health promotion should be carried out in a way that increases workers' decision-making opportunities (a predictor of healthier behaviors and reduced chronic health outcomes) or it will undermine the program's goals. This does not mean disempowering managers, but rather engaging all levels within the workplace in a genuine dialogue.

Almost 20 years ago, the World Health Organization (WHO) introduced the term “social health promotion,”²⁰ calling attention to the importance of environmental conditions that foster (or impede) healthy behaviors. More recently, WHO has defined a healthy workplace as “one in which workers and managers collaborate to use a continual improvement process to protect and promote the health, safety and well-being of all workers and the sustainability of the workplace.”²¹ World Health Organization has specifically cited the need for “positive human relations at work that foster decision-making and self-efficacy.” It called upon managers to then address “health and safety concerns in the physical work environment” and “health, safety and well-being concerns in the psychosocial work environment including organization of work and work place culture” as part of the activities required to create a “healthy workplace.”

The levels of the workplace, as conceptualized in the macroergonomics construct, map closely onto the socioeconomic model of public health, which is commonly used in the design of health pro-

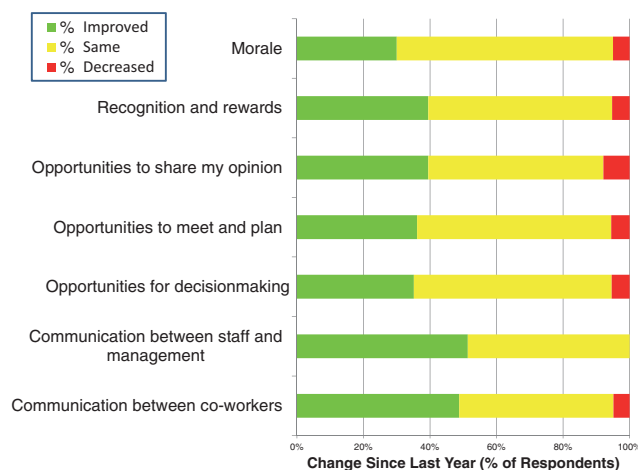
motion programs in communities as well as workplaces.^{22,23} This model states that changes at the individual level will not be possible or sustainable without attention to higher-level environmental constraints and determinants. This is analogous to the macroergonomics paradigm and the PE approach of involving stakeholders from all levels of the organization.

The CPH-NEW advocates a sustainable programmatic approach that engages employees on a regular basis in identifying workplace problems, setting priorities, and developing solutions, thereby facilitating a sense of employee ownership over both the program itself and any resulting interventions. This programmatic approach is also designed to improve the health of the organization through improved organizational communication and provision of opportunities for integrating ergonomics with health promotion initiatives.

Furthermore, because psychosocial stress is a key contributor to both chronic disease and precursor health behaviors, it is crucial to seek an ergonomics model that is well-suited to address job stress. One essential structural aspect of job stress reduction is improved worker decision latitude. Participatory ergonomics addresses this basic work design characteristic through a process in which employees learn ergonomic fundamentals (including physical, psychosocial, and organizational risk factors). Beyond being trained, however, workers also engage in priority setting, brainstorming of solutions, and examining the interactions among workplace and work organization design issues.

The CPH-NEW “IDEAS” tool²⁴ formalizes a PE approach to intervention planning. The IDEAS tool provides a viable means for applying the integrated TWH concept in practice. A PE framework is crucial to adapting or addressing the many job- and organization-level factors that can either help support or interfere with a proposed intervention. The IDEAS tool directs specific attention to broad identification of both workplace facilitators as well as barriers to each intervention alternative proposed.

At one CPH-NEW study site, for example, landscaping and maintenance workers were invited to consider how to improve their health, directly or indirectly, without need to distinguish “work-related” risk factors from “personal” risk factors. The team prioritized stress as a major health problem, with multiple communication issues identified as root causes. For example, one effect of

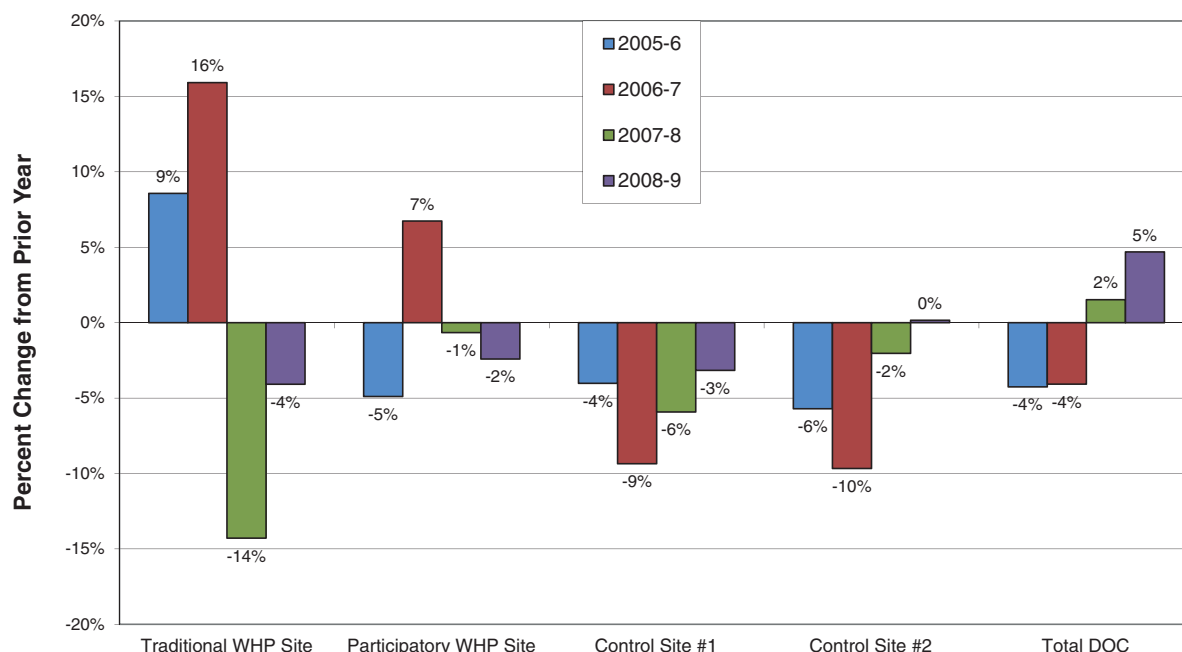


* Percentages exclude “Don’t know” responses from the denominator.

FIGURE 2. Real estate maintenance workers: Perceived changes in company climate in the past year, from survey of all maintenance personnel at the study site (45 respondents of 60 personnel).

TABLE 1. Results of Qualitative Evaluation of “IDEAS” Process by Design Team Members (Workers) and Managers at a Real Estate Maintenance and Landscaping Firm

Design Team Members	Management Representatives
A useful forum/tool for making improvements	More aware of workers' concerns
Solution-driven: Made change happen	Resident education materials are a good solution
Interaction-driven: Improved communication between technicians and management	Personal development of DT members: Problem-solving, communication skills, pride, accomplishment
Felt engaged and invested in the program	Wish to see the program continue

**FIGURE 3.** Percent change in sickness absenteeism rate over 4 years in Connecticut Department of Correction facilities: Traditional (expert-driven) WHP program, PE/WHP program, two “control” (nonintervention) sites, and statewide experience (“Overall:” 19 facilities). Interventions began in 2007.

disorganized and incomplete communication among maintenance workers, property renters/clients, and front office dispatchers was that maintenance workers were often sent out unnecessarily for minor issues that took valuable time away from handling pressing service needs elsewhere in a timely manner. This resulted in time pressure, lack of satisfaction, frustration, and cynicism. Workers discussed multiple sources of the communication problems, presented their analysis to supervisors and managers, and proposed a range of possible solutions. This process involved several structured discussions with management and workers to select and implement solutions.

The job scheduling system was consequently redesigned, in combination with other measures to improve communication and work climate such as replacement of poor phone and pager service, and educational materials to help office personnel and rental clients understand basic rental unit operating instructions. Subsequent to implementing employee-designed interventions, a survey of all maintenance personnel at the study site was conducted to assess perceived impact. Respondents saw improvements in a wide variety of areas, especially in communication between staff and management (Fig. 2). Although we cannot attribute the perceived improvements exclusively to the participatory program, there is certainly evidence of a connection.

- Communication with managers and coworkers was a root cause of stress reported by maintenance staff at the start of the program, and it became a specific goal of the intervention effort.
- Communication ranked the highest in perceived improvements.
- The program itself promotes organized forms of communication about safety and health between frontline employees and upper management. A structure was established for periodic meetings between management and workers in which safety concerns would be addressed. These discussions resulted in new learning for workers and managers and facilitated a deeper understanding of each other's perspectives.

The perceived usefulness and effectiveness of the program were also assessed from interviews with the employees involved in the design efforts and management representatives who interacted with the team. The employee design team members saw the participatory program as useful because it provided them with an important forum for raising concerns, as well as a tool for improving the workplace (Table 1). Managers became more aware of workers' concerns, recognized personal development of the design team members, and viewed the proposed interventions as good solutions. Of note, the success of the program was highly dependent upon the program

facilitator's ability to remain impartial throughout intervention planning. The organization expressed subsequent interest in hiring a facilitator so that the program would continue after the research study ended.

Preliminary evidence of health benefits from the participatory model comes from another CPH-NEW study underway within the Connecticut State Department of Correction (DOC). Correction officers are at high risk for chronic disease due to obesity, hypertension, depression, and other risk factors.^{25,26} One DOC facility received a PE/WHP program for corrections officers, to be compared with a traditional expert-driven program in another. Again, the participatory program was designed and implemented with the explicit goal of enhancing decision latitude and with a broad invitation to raise any health concerns. Topics ranged from heat stress from poorly designed uniforms to poor communication and other obstacles to job performance.

The sickness absenteeism rates shown in Figure 3 represent the two intervention sites and two control sites selected at study inception as the four most similar prisons in the system, based on facility characteristics and supervisor responses to a survey about organizational readiness. Data are also shown for all 19 DOC facilities. Lost time at the participatory site was lower than that at the traditional site after the introduction of interventions (2007) and was also reduced in comparison with the overall total. Inferences must be cautionary because the two study sites had worse rates than the DOC statewide before interventions, for unknown reasons. Nonetheless, the greatest decrease in absenteeism in the participatory site, both in comparison to the traditional program and to the rest of the state system, occurred during the later 2 years, when the participatory program could be said to be hitting its stride. Perhaps most telling is that, after the introduction of interventions in 2007, the participatory site experienced the largest annual decreases in absenteeism, in contrast to the traditional intervention site, the control sites, and DOC as a whole.

An interesting parallel is provided by the weight loss program offered at the participatory site.²⁷ The program was developed by the employee design team, addressing a variety of issues in the work environment affecting motivation, physical activity, and knowledge of and access to healthy food. Participants in the full program had an average weight loss of 1.8 body mass index (± 0.4) at 20 weeks, or more than 5% of their starting values, compared with a slight weight increase in a comparable group of nonparticipants.

In summary, the CPH-NEW's programmatic approach to integrating OSH and WHP, utilizing PE as a model, offers the following strengths:

- Participatory problem solving and employee engagement address both health promotion (WHP) and protection (OSH).
- The influence of work organization on personal behaviors is emphasized, particularly the contribution of low decision latitude to job stress, one of the root causes of unhealthy behaviors.
- There is attention to process: how interventions are planned and carried out, not only what health and safety needs these interventions address.
- The program structure affords a pathway for regular review by upper management decision makers of interventions proposed by employee design teams, contributing to program sustainability and the institutionalization of a process for continuous improvement of employee health protection and promotion.

We have demonstrated the relevance of PE to WHP on two parallel bases. One is that psychosocial stress contributes to the individual health behaviors that are typical targets of WHP programs. Ergonomics entails remediation of psychosocial as well as physical hazards in the workplace. A process that lacks employee involvement in hazard identification and solution design may be disempowering and thus add rather than reduce job stress. Furthermore, a WHP program that fails to empower workers as problem solvers will not

be effective or sustainable over the long-term. Conversely, success in a broadly designed ergonomics program may contribute to a WHP effort, even if inadvertently.

The other basis is that both OSH and WHP problems arise within a multilevel construct in which multiple organizational levels, including workers, supervisors, and managers, are the locus of entrenched health risk factors, often despite hazard recognition. Therefore, effective remediation requires a participatory process, with genuine opportunities for participation in decision making by employees at these multiple levels. A successful worker health program must identify and improve determinants of hazards as well as constraints on individual behaviors that exist at each level. This cannot be achieved without direct input from affected workers as well as input and support from supervisory and managerial levels. The PE approach promotes the multiple input, cross-level communication, and the trust necessary to create sustainable organizational and individual health.

REFERENCES

1. Hendrick H, Kleiner B, eds. *Macroergonomics: Theory, Methods, and Applications*. Boca Raton, FL: CRC Press; 2002.
2. Karasek RA, Brisson C, Kawakami N, Houtman ILD, Bongers PM, Amick BC. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. *J Occup Health Psychol*. 1998;3:322–355.
3. Siegrist J. Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol*. 1996;1:27–41.
4. Büsing A. Social tolerance of working time schedules. A comparison between nurses of West and East German general hospitals. *Work Stress*. 1996;10:238–250.
5. Fujishiro K, Heaney CA. Justice at work, job stress, and employee health. *Health Educ Behav*. 2009;36:487–504.
6. Ndjaboué R, Brisson C, Vézina M. Organisational justice and mental health: a systematic review of prospective studies. *Occup Environ Med*. 2012;69:694–700.
7. De Castro AB, Curbow B, Agnew J, Haythornthwaite JA, Fitzgerald ST. Measuring emotional labor among young workers: refinement of the Emotions at Work Scale. *AAOHN J*. 2006;54:201–209.
8. Kim SS, Muntaner C, Kim H, Jeon CY, Perry MJ. Gain of employment and depressive symptoms among previously unemployed workers: a longitudinal cohort study in South Korea. *Am J Ind Med*. 2013 Jun 21 [Epub ahead of print]. doi: 10.1002/ajim.22201.
9. MacDonald LA, Karasek RA, Punnett L, Scharf T. Covariation between workplace physical and psychosocial stressors. *Ergonomics*. 2001;44:696–718.
10. National Institute for Occupational Safety and Health. *The Changing Organization of Work and the Safety and Health of Working People*. Cincinnati, OH: DHHS (NIOSH); 2002. Publication No. 2002-116.
11. Lamontagne AD, Keegel T, Louie AM, Ostry A. Job stress as a preventable upstream determinant of common mental disorders: a review for practitioners and policy-makers. *Adv Mental Health*. 2010;9:17–35.
12. Henning R, Warren N, Robertson M, Faghri P, Cherniack M; CPH-NEW Research Team. Workplace health promotion through participatory ergonomics: an integrated approach. *Public Health Reports*. 2009;124:26–35.
13. Albertsen K, Borg V, Oldenburg B. A systematic review of the impact of work environment on smoking cessation, relapse and amount smoked. *Prev Med*. 2006;43:291–305.
14. Kivimäki M, Kuusma P, Virtanen M, Elovainio M. Does shift work lead to poorer health habits? A comparison between women who had always done shift work with those who had never done shift work. *Work Stress*. 2001;15:3–13.
15. Ostry AS, Radi S, Louie AM, Lamontagne AD. Psychosocial and other working conditions in relation to body mass index in a representative sample of Australian workers. *BMC Public Health*. 2006;6:53.
16. Brunner EJ, Chandola T, Marmot MG. Prospective effect of job strain on general and central obesity in the Whitehall II Study. *Am J Epidemiol*. 2007;165:828–837.
17. Brisson C, Larocque B, Moisan J, Vézina M, Dagenais GR. Psychosocial factors at work, smoking, sedentary behavior, and body mass index: a prevalence study among 6995 white collar workers. *J Occup Environ Med*. 2000;42:40–46.
18. Chandola T, Britton A, Brunner E, et al. Work stress and coronary heart disease: what are the mechanisms? *Eur Heart J*. 2008;29:640–648.

19. Punnett L, Cherniack M, Henning R, Morse T, Faghri P; CPH-NEW Research Team. A conceptual framework for the integration of workplace health promotion and occupational ergonomics programs. *Public Health Reports*. 2009;124:16–25.
20. World Health Organization. *Ottawa Charter for Health Promotion*. Geneva, Switzerland: World Health Organization; 1986. WHO/HPR/HEP/95.1.
21. World Health Organization. *Healthy Workplaces: A Model for Action*. Geneva, Switzerland: World Health Organization; 2010. Available at http://whqlibdoc.who.int/publications/2010/9789241599313_eng.pdf. Accessed on June 15, 2013.
22. Linnan LA, Sorensen G, Colditz G, Klar DN, Emmons KM. Using theory to understand the multiple determinants of low participation in worksite health promotion programs. *Health Educ Behav*. 2001;28:591–607.
23. Baron SL, Beard S, Davis LK, et al. Promoting integrated approaches to reducing health inequities among low-income workers: applying a social ecological framework. *Am J Ind Med*. 2013 Mar 26 [Epub ahead of print]. doi: 10.1002/ajim.22174.
24. Robertson M, Henning R, Warren N, et al. The Intervention Design and Analysis Scorecard (IDEAS): a planning tool for participatory design of integrated health and safety interventions in the workplace. *J Occup Environ Med*. 2013.
25. Morse T, Dussetschleger J, Warren N, Cherniack M. Talking about health: correction employees' assessments of obstacles to healthy living. *J Occup Environ Med*. 2010;53:1037–1045.
26. Obidoa C, Reeves D, Warren N, Reisine S, Cherniack M. Depression and work family conflict among corrections officers. *J Occup Environ Med*. 2011;53:1294–1301.
27. Ferraro L, Faghri PD, Henning R, Cherniack M; Center for the Promotion of Health in the New England Workplace Team. Workplace-based participatory approach to weight loss for correctional employees. *J Occup Environ Med*. 2013;55:147–155.