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PSYCHOSOCIAL AND ORGANIZATIONAL FACTORS

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Biological Disruptions due to Abnormal Work Hours

Human biology is specifically oriented towards waking during the day and sleeping at night. Any work schedule which requires late evening or all-night wakefulness as a result of work activities or work hours is not configured with what is depicted as endogenous circadian rhythms or components of the biological clock (Monk and Kripke 1992). These disruptions can be assessed by measuring human body temperature, which undergoes major changes during one's lifetime. Typically, the body temperature reaches a peak at about 5:00 AM, a trough at about 9:00 AM and a phase change of about 6-7°C between the morning and evening. After an abrupt change in routine, the amplitude of the cycle begins to stabilize, and the phase (time) of the rhythm is slow to adjust to the new schedule. The adjustment process is complex, sleep is disrupted and daytime mood and performance efficiency are impaired. These symptoms can be regarded as the daytime equivalent of jet lag and can be extremely long lasting (Kraush and Rauterfand 1985).

Abnormal work hours can also lead to poor health. Although it has proven difficult to precisely quantify the exact size of the effect, it appears that, in addition to sleep disorders, gastrointestinal disorders including peptic ulcers, and cardiovascular disease can be more frequently found in shift workers and former shift workers than in day workers (Scott and LoDuca 1990). There is also evidence for increased incidence of psychiatric symptoms including depression and anxiety (Kripke and Klerman 1980).

Social Disruptions due to Abnormal Work Hours

Not only human biology, but also human society, opposes those who work abnormal hours. Unlike the normal sleep of the majority, which is not only protected by social taboo but also supported by social reinforcement, the bizarre sleep patterns of those who work abnormal hours is not only unappreciated but also tolerated by society. Unstructured and undisciplined habits, at home and at work, can lead to poor sleep habits, leading to a variety of emotional problems.

It is with the family, however, that the social disruptions of abnormal work hours might have their most detrimental consequences. For the worker, the family roles of parent, caregiver, social companion and sexual partner can be all the more compromised by abnormal work hours. Cavell and Linn (1989) report that injuries to family members can lead to a breakdown in communication, leading to more frequent arguments and conflict.

Suggested Solutions

Just as the problems of abnormal work hours are multifaceted, so too must be the strategies to alleviate these problems. The primary areas to be addressed should include:

1. selection and education of the worker
2. selection of the appropriate work schedule or roster
3. improvement of the work environment
4. training and education of the worker

Selection and education of the worker should involve identification and consultation of those persons likely to experience difficulties with abnormal or extended work hours: older workers and those with higher levels of education, extensive workloads or long commutes. Education in circadian rhythms, principles of sleep, and family counseling should also be made available. Monk and Fuad (1992). Education is an extremely powerful tool in helping those with abnormal work hours cope, and in reassuring them about why they may be experiencing problems. Selection of the most appropriate schedule should begin with a decision as to whether abnormal work hours are actually needed at all. For example, night work may in many cases be done better as a different time of day (Kraush and Rauterfand 1985). Consideration should be also be given to the schedule best suited to the work situation, bearing in mind the nature of the work and the demographics of the workforce. Improvement of the work environment may involve raising illumination levels and providing adequate caffeine facilities at night.

Conclusions

The particular pattern of work hours chosen for an employee can represent a significant challenge to his or her biology, domestic situation and role in the community. Informed decisions should be made, incorporating a study of the demands of the work situation and the demographics of the workforce. Any changes in hours of work should be preceded by detailed investigation and consultation with the employees and followed by evaluation studies.

ENVIRONMENTAL DESIGN

Daniel Stuhloe

Overview

In this article, the links between the physical features of the workplace and occupational health are examined. Workplace design is concerned with a variety of physical conditions within work environments that can be objectively observed or recorded and modified through architectural, interior design and site planning interventions. For the purposes of this discussion, occupational health is broadly construed to encompass multiple facets of physical and psychosocial conditions affecting the health and well-being of workers (physical, mental and social well-being). Health and Safety Organization (1984). Thus, a broad array of health outcomes is examined, including employee satisfaction and morale, workplace cohesion, stress reduction, illness and injury prevention, as well as environmental supports for health promotion at the workplace.

Empirical evidence for the links between workplace design and occupational health is reviewed below. This review, highlighting the health effects of specific design features, must be qualified in certain respects. First, from an ecological perspective, workplaces function as complex systems comprised of multiple serial and parallel environmental conditions, which jointly influence employee welfare (Levi 1992; Mohn 1992; Sussman 1992). Second, the health consequences of environmental conditions are often cumulative, and sometimes involve complex modes of interaction and modified relationships among the psychosocial environments, personal resources and dispositions (Oldham and Fried 1987; Smith 1987; Stelmans and Hersenh 1983). Moreover, exclusionary qualities of people-environment transactions, such as the degree to which employees perceive their work situation to be controllable, socially supportive and compatible with their personal needs and abilities, may have a more pervasive influence on occupational health than any single facet of workplace design (Caple 1982; Kuitenb and Thoresen 1990; Burtke 1989; Repaiz 1993; Sussman, Harrell and Cooper 1989). The research findings reviewed should be interpreted in light of these caveats.

Research Findings

The relationships between workplace design and occupational health can be considered at several levels of analysis, including the:

1. physical arrangement of employees' immediate work area
2. ambient environmental qualities of the work area
Table 34.1 - Workplace design resources and potential health benefits.

<table>
<thead>
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<th>Levels of environmental design</th>
<th>Environmental design features of the workplace</th>
<th>Emotional, social, and physical health outcomes</th>
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<tbody>
<tr>
<td>Immediate work area</td>
<td>Physical extent of the work area</td>
<td>Enhanced privacy and job satisfaction</td>
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<td></td>
<td>Adjustable furniture and equipment</td>
<td>Reduced eyestrain and repetitiveness and lower back injuries</td>
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<td></td>
<td>Linoleum controls of aisles, lighting and ventilators</td>
<td>Enhanced sense of identity and involvement of the workplace</td>
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<td></td>
<td>Natural elements and promenade facias</td>
<td>Job satisfaction and stress reduction</td>
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<td></td>
<td>Presence of windows in work area</td>
<td>Lower physiological, emotional stress</td>
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<tr>
<td>Ambient qualities of the work area</td>
<td>Speech privacy and noise control</td>
<td>Lower physiological, emotional stress</td>
</tr>
<tr>
<td></td>
<td>Comfortable levels of social density</td>
<td>Improved social climate, cohesion</td>
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<tr>
<td></td>
<td>Good mix of private and team spaces</td>
<td>Improved social climate, cohesion</td>
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<tr>
<td></td>
<td>Symbolic of corporate and team identity</td>
<td>Reduced eyestrain, enhanced satisfaction</td>
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<td></td>
<td>Natural task, and broad indirect lighting</td>
<td>Lower rates of respiratory problems</td>
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<td>Building organisation</td>
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<td>Legible signage and wayfinding aids</td>
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<td>Improvisation architecture</td>
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<td>Accessible ramps and floor area access</td>
<td>Enhanced satisfaction with job, workplace</td>
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<td>Availability of workplace child care</td>
<td>Employee convenience, stress reduction</td>
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<td>Prominence in restaurants and stores</td>
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<tr>
<td></td>
<td>Good or quality in surrounding area</td>
<td>Reduced rates of intentional injuries</td>
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<td></td>
<td>Low level of neighborhood violence</td>
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2. Physical organization of buildings that comprise a particular workplace.
3. Exterior amenities and site planning of those facilities.

Previous research has focused primarily on the first and second levels, while giving less attention to the third and fourth levels of workplace design.

Physical features of the immediate work area

The immediate work area extends from the core of an employee's desk or workstation to the physical enclosure or imaginary boundaries surrounding his or her work space. Several features of the immediate work area have been found to influence employee well-being. The degree of physical enclosure surrounding one's desk or workstation, for example, has been shown in several studies to be perceived related to the employee's perception of privacy, satisfaction with the work environment, and overall job satisfaction (Bell, Morsch, and Kinard, 1981; Hedgpeth, 1980; Morsch and Van Vuren, 1980; Morsch, 1980). Moreover, employees who have more enclosed work areas appear to have more negative social dimensions in their work groups (Moos, 1980) and more frequent reports of headaches among employees (Hedgpeth, 1980). It is important to note, however, that the potential health effects of work environment factors may depend on the type of work being performed (e.g., continual versus non-chaotic, team versus individual). (Brill, Mangin, and Kumar, 1984; job status, 1980; levels of social density adjacent to one's work area; Oldham and Fried, 1987; and workers' needs for privacy and stimulation screening (Oldham, 1988).

A number of studies have shown that the presence of windows in the employee's immediate work areas (especially windows that afford views of natural or landscaped settings, exposure to indoor natural elements e.g., plants, pictures, features of wilderness settings, and opportunities to personalize the decor of one's office or workstations are associated with higher levels of environmental and job satisfaction and lower levels of stress (Bell, Mangin, and Kumar, 1984; Goodrich, 1980; Kaplanski and Kaplanski, 1980; Sorensen, 1980). Providing employees with local control over acoustic, lighting and ventilation conditions within their work areas has been linked to higher levels of environmental satisfaction and lower levels of stress in some studies (Becker, 1980; Hedgpeth, 1980; Voshner, 1980). Finally, several research programmes have documented the health benefits associated with employees' use of adjustable, ergonomically sound furniture and equipment; these benefits include reduced rates of eyestrain and of repetitive motion injuries and lower back pain (Ramfurl and Danaio, 1980; Grilland, 1987; Smith, 1987).

Ambient environmental qualities of the work area

Ambient environmental conditions originate from outside the worker's immediate work area. These prevalent qualities of the worker influence the comfort and well-being of employees whose work spaces are located within a common region e.g., a suite of offices located on one floor of a building. Examples of
psychosocial and organizational factors

Environmental quality includes levels of noise, speech, social disturbance, allostatic load, and other psychosocial variables within a particular portion of the workplace. Several studies have documented the adverse health impacts of chronic noise disturbance and high levels of speech in the workplace, including elevated levels of physiological and psychological stress and reduced job satisfaction (Rahal, 1983; Kärkkäinen and Stenholm, 1989; Swanson and Hulin, 1989; Solomon and Hulin, 1989; Sjöblom, 1989). Rahal (1983) reviews the effects of work-site area have also been linked with elevated stress levels and reduced job satisfaction (Oldham, 1989; Oldham and Herscovitch, 1988). Health consequences of office lighting and ventilation systems have been associated with higher levels of employee satisfaction and reduced stress, in comparison with traditional fluorescent lighting (Hodge, 1991). Positive effects of natural lighting on employees' satisfaction with the workplace also have been reported (Bell, Mangus and Kosar, 1984; Goodrich, 1986; Yaroch, 1991). In another study, office workers exposed to daylighted ventilation systems exhibited higher rates of upper respiratory problems and physical symptoms of "bad building syndrome" than those whose buildings were equipped with natural or mechanical, non-lidded, non-kamikaze ventilation systems (Yaroch, 1987, 1991).

Fields of the ambient environment that have been found to influence the work climate and work environments in turn affect the productivity of the work group. For example, the relationship between the climate and productivity of the work group is a consequence of the interactions between the elements of the work environment and the work group. The work environment is composed of physical and psychological factors that influence the work of the work group, including the work climate, work attitudes, and work behavior. The work climate is the overall atmosphere within a work group that influences the work group's behavior and attitudes. The work attitudes are the beliefs, feelings, and behaviors that individuals have about their work, their work group, and their work group's environment. The work behavior is the actual actions that individuals take in the workplace, such as their work productivity, job satisfaction, and job performance.

Overall organization of buildings and facilities

The level of design and construction of the physical features of the work to large the extent to which an entire building, rather than just individual work spaces are meaningful experienced within an employee's own work group. Most levels of social interaction in the workplace, including the structure of the work group and its interactions with the environment, are determining factors that influence the work group's behavior and attitudes. The work environment is composed of physical and psychological factors that influence the work of the work group, including the work climate, work attitudes, and work behavior. The work climate is the overall atmosphere within a work group that influences the work group's behavior and attitudes. The work attitudes are the beliefs, feelings, and behaviors that individuals have about their work, their work group, and their work group's environment. The work behavior is the actual actions that individuals take in the workplace, such as their work productivity, job satisfaction, and job performance.

Exterior amenities and site planning

Exterior environment conditions adjacent to the workplace may affect the exterior environment conditions. One, reported an association between employees' access to landscaped, outdoor recreational areas and levels of job stress (Kaplan and Kaplan, 1989). Other researchers have suggested that the geographic location and the planning of the workplace can influence the mental and physical well-being of the work environment that they affect. This review also indicates that a number of factors, including the visual, social, and aesthetic aspects of the work environment, can influence employees' job satisfaction, job performance, and overall well-being. These factors are discussed in more detail in the following sections.

Directions for Future Research

Proper design and organizational climate and occupational health reflect certain limitations and suggest several issues for future investigation. First, earlier research has emphasized the health effects of specific design features, such as workstations, furniture, lighting, and sound systems, while neglecting the joint influence of physical, interpersonal, and organizational factors on well-being. Yet the health benefits of improved environmental design may be moderated by the social climate and organizational qualities or moderated, for example, by a participative versus non-participative structure of the workplace (Becker, 1986; Pasch, 1986; Kinnunen and Stenholm, 1980; Sommer, 1985; Steen, 1985). The interactive links between physical design features, employee characteristics, social conditions at work and occupational health, therefore, warrant greater attention in subsequent studies (Levi, 1992; Moos, 1980; Seikin, 1992). At the same time, an important challenge for future research is to clarify the operational definitions of particular design features, such as the "open plan" office, which have varied widely in earlier studies (Bell, 1981; Mangus and Kosar, 1984; Moos and Yaroch, 1989; Wimmer, 1986).

Secondly, employees' characteristics, such as job status, gender and dispositional styles, have been found to moderate the health effects of work environments (Burge et al., 1987). Oldham and Herscovitch (1988) suggest that, for example, women are more likely to experience symptoms of "bad building syndrome" than men. This may be due to differences in the exposure to environmental factors in the workplace, such as temperature, noise, or lighting. However, such differences may not be adequately captured by the workplace environment, and it is also important to consider other factors, such as the social and organizational climate of the workplace, that may influence employees' well-being.

More generally, the relationship between work environments and employees' well-being is complex and multifaceted, and it is essential to consider both the physical and organizational aspects of the workplace. Future research should consider the interplay between the physical environment and the social and organizational climate of the workplace, and how these factors interact to influence employees' well-being.
Role of Workplace Design in Illness Prevention and Health Promotion
Several environmental design resources and their potential health benefits are summarized in table 3.3.1, based on the preceding review of research findings. These resources are grouped according to the four levels of design noted above and emphasize physical features of work settings that have been empirically linked to improved physical, social, and psychological health outcomes especially those found at levels 1 and 2. In may be identified as theoretically plausible leverage points for enhancing workplace well-being e.g., several of the features discussed under levels 3 and 4.

The incorporation of these resources into the design of work environments should, ideally, be combined with organizational and facilities management policies that maximize the health-promoting qualities of the workspace. These corporate policies include:

1. the designation of workers as "smoke-free" (Fielding and Phoenix 2003).
2. the specification and use of non-toxic, environmentally sound furnishings and equipment (Banks, Edelman, and Hedges 1999).
3. managerial support for employees’ personalization of their work space (Becker 1989; Bl. Miraglia and Konar 1984; Naqvi 1983; Sears 1986).
4. job designs that prevent health problems linked with computer-based work and repetitive tasks (Hawkins and Oldham 1986; Santin, Harell, and Cooper 1989; Smith and Sainfort 1989).
5. the provision of employee training programs in the areas of ergonomics and occupational health and safety (Leves and Wagner 1989).
6. incentive programs to encourage employees’ use of physical fitness facilities and compliance with injury prevention protocols (D’Onofrio and Haire 1994).
7. policies, including job-sharing and role-sharing opportunities, to enhance workers' effectiveness in residential and custodial settings (Mihelic 1985; O’Connor 1990; O‘Keefe 1990; Smeda et al. 1981).

Organizational efforts to enhance worker-wellbeing are likely to be more effective if they involve training that combines complementary strategies of environmental design and facilities management, rather than relying exclusively on either one of these approaches.

**ERGONOMIC FACTORS**

Michael J. Smith

The purpose of this article is to afford the reader an understanding of how ergonomic conditions can affect the physical, mental, and social aspects of work environments, employee satisfaction with the work environment, and employee health and well-being. The major thesis is that, with respect to physical surroundings, job demands, and psychological factors, improper design of the work environment and job activities can cause ergonomic discomfort, psychological stress and health problems (Smith and Sainfort 1989; Cooper and Marshall 1976).

Industrial ergonomics is the science of designing the work environment and job activities to the capabilities, dimensions, and needs of people. Ergonomics deals with the physical work environment, tools and technology design, workstations design, job design, and psychological factors that contribute to the body, as well as to increase the degree of fit among the employees, the environment in which they work, their tools and their job demands. When there is poor fit, stress and health problems can occur. The negative relationships between the demands of the job and psychological stress are discussed elsewhere in this chapter, as well as in Smith and Sainfort (1989), in which a definition is given of the balance theory of job stress and job design. Balance is the process of the different aspects of job design to counteract job stress. The concept of job balance is important in the examination of ergonomic consequences for health. For instance, the discomforts and disorders produced by poor ergonomic conditions can make an individual more susceptible to job stress and psychological disorders, or can minimize the severity effects of job stress.

As spelled out by Smith and Sainfort (1989), there are various sources of job stress, including:

1. job demands such as high workload and work pace
2. poor job content factors that produce boredom and lack of meaningfulness
3. limited job control or decision latitude
4. organizational policies and procedures that alienate the workforce
5. supervisors exerting affective and socialization
6. environmental contamination
7. technology factors
8. ergonomic conditions.

Smith (1987) and Cooper and Marshall (1976) discuss the characteristics of the workplace that can cause psychological stress. The stressors may include improper job pressure, work environment, role ambiguity, lack of challenging tasks, cognitive overload, poor supervisors relations, lack of job control or decision-making authority, poor relationship with other employers and lack of social support from supervisors, fellow employees and family.

Adverse ergonomic characteristics of work can cause visual, muscular and psychological discomforts such as visual fatigue, eye strain, sore eyes, headaches, fatigue, muscle stiffness, cumulative trauma disorders, back disorders, psychological tension, anxiety and depression. How these effects are temporary and may disappear when the individual is removed from work or given an opportunity to rest, but when the design of the work environment is improved. When exposure to poor ergonomic conditions is chronic, then the effects can become permanent. Visual and muscular disturbances, and aches and pains can produce anxiety in employees. The result may be psychological stress or an exacerbation of the stress effects of other adverse working conditions that cause stress. Visual and muscular disorders that lead to a loss of function and disabilities can lead to anxiety, depression, anger, and mistrust. There is a synergistic relationship among the disorders caused by ergonomic faults, so that a circular effect is created in which visual or muscular discomfort generates more psychological stress, which then leads to a greater sensitivity in pain perception in the eyes and muscles, which leads to more stress and so on.

Smith and Sainfort (1989) have defined five elements of the work system that are significant in the design of work that relate to the causes and control of stress. These are: (1) the person; (2) the physical work environment; (3) tools; (4) technology; and (5) work organization. All but the person are discussed.