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CHAPTER 18

Stress in Organizations

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Stress in organizations is a widespread phenomenon with far-reaching practical and economic consequences. A report published by the National Institute for Occupational Safety and Health (1999) in the United States summarized findings from various surveys on organizational stress and found that between 26 and 40% of all surveyed workers experienced their work as very stressful. Similarly, 28% of the workers in the European Union reported that their work causes stress (Levi & Lunde-Jensen, 1996). In Japan, the percentage is even higher than either of these (Harnois & Gabriel, 2000).

Experiencing organizational stress is related to health problems and their associated costs. A study based on more than 46,000 U.S. employees showed that health care costs were 46% higher for workers who experienced high levels of stress (Goetzel et al., 1998). Moreover, organizational stress is assumed to be related to increased absenteeism. For example, estimates from the U.S. and England suggest that about the half of all lost days within organizations are related to workplace stress (Cooper, Liukkonen, & Cartwright, 1996; Elkin & Rosch, 1990). Absenteeism costs organizations billions of dollars per year (Cox, Griffiths, & Rial-Gonzáles, 2000). In the long run, stress might lead to disabilities. Data from the Netherlands show that 30% of all cases of disability pensions are due to stress-related disorders (Van der Hek & Plomp, 1997), and similar findings exist for other countries. Moreover, mortality rates were found to be related to occupational groups—that is, to work-specific stressors (Fletcher, 1991).

Because of this practical relevance of workplace stress, there is an enormous and still ongoing research activity within the field of organizational stress (Beehr, 1995). Findings from past research have been summarized in previous review chapters and journal articles (Beehr & Newman, 1978; Danna & Griffin, 1999; Ganster & Schaubroeck, 1991; Kahn & Byosiere, 1992; McGrath, 1976; Sullivan & Bhagat, 1992). Many researchers criticized organizational stress studies for methodological weaknesses (Frese & Zapf, 1988; Kasl, 1978). Their main concerns referred to the following issues: The overwhelming majority of the empirical studies are cross-sectional in nature and do not allow inferences on causality. In many studies the independent and dependent measures share common method variance and overlap in content. Most studies focus on bivariate, linear

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relationships and neglect possible moderator and nonlinear effects.

Nevertheless, over the years researchers witnessed methodological improvements in organizational stress studies (Beehr, 1998; Kahn & Byosiere, 1992), particularly during the past 10 years; the improvements include (a) a better operationalization of basic concepts that allow a better test of theoretical models (e.g., Edwards & Harrison, 1993; Wall, Jackson, Mullarkey, & Parker, 1996); (b) an increasing number of studies that use objective measures of stressors (Greiner, Ragland, Krause, Syme, & Fisher, 1997; Melamed, Ben-Avi, Luz, & Green, 1995); (c) a steady increase in longitudinal studies, with many of them using a structural equation modeling approach for data analysis (e.g., Bakker, Schaufeli, Sixma, Bosveld, & van Dierendonck, 2000; Dormann & Zapf, 1999; Schonfeld, 1992); (d) exploration of curvilinear effects (e.g., de Jonge & Schaufeli, 1998; Dollard, Winefield, Winefield, & de Jonge, 2000; Warr, 1990); and (e) use of innovative approaches such as multilevel designs (e.g., Jex & Bliese, 1999) and growth curve models (e.g., Barnett & Brennan, 1997; Garst, Frese, & Molenaar, 2000).

This chapter reviews research on stress in organizations and its practical implications. It aims at an extension of previous reviews by focusing more strongly on methodologically sound—although not perfect—studies. This gives us the opportunity to examine more deeply the processes and consequences associated with organizational stress. Specifically, we address the question of whether methodologically improved studies contribute to a better understanding of organizational stress. Most of the more recent review chapters and articles have exclusively looked at health and well-being consequences of organizational stress (Danna & Griffin, 1999; Ganster & Schaubroeck, 1991; Kahn & Byosiere, 1992). We broaden the view by including performance and other organizational behavior issues (e.g., organizational commitment and absenteeism).

In the first section of this chapter, we describe the stress concept and give an overview of stressors and stress reactions. In the second section, we present theories of organizational stress. The third section is devoted to empirical findings in organizational stress research. We describe the empirical evidence of main and moderator effects on the relationship between stressors and individual health and well-being. We summarize research findings on the relationship between stress and performance. In addition, we refer to the effects of stress on other aspects of organizational behavior. In the fourth section, we describe stress management interventions. In conclusion, we suggest a few research questions for the future.

THE STRESS CONCEPT

Overview of Conceptualizations of Stress

On the most general level, one can differentiate between four stress concepts: (a) the stimulus concept, (b) the response concept, (c) the transactional concept, and (d) the discrepancy concept. The stimulus concept focuses on situational conditions or events. Within this conceptualization, certain stimuli are stressful—for example, high time pressure, interpersonal conflict at work, or accidents. However, the stimulus concept is problematic because not all individuals react in a uniform manner to the same stressor. Nearly every situational condition or every event may evoke strain in some individuals. Although the stimulus conceptualization leads to conceptual problems, many researchers agree that there are subsets of stimuli that evoke strain in most individuals (Brief & George, 1995; Kahn & Byosiere, 1992).

The reaction concept focuses on physiological reactions as the crucial constituent of stress—that is, stress exists if an individual shows a specific reaction pattern regardless of situational characteristics (Selye, 1956). However, this conceptualization also has its shortcomings. It does not take into account that very different situations can result in the same physiological responses and that an individual's coping efforts may have an effect on that individual's reactions, thus altering the stress response.

Another class of concepts refers both to the situation and to the person when defining stress. The transactional concept brought forward by Lazarus (1966) assumes that stress results from a transaction between the individual and the environment, including the individual's perceptions, expectations, interpretations, and coping responses. In terms of operationalization and measuring stress in empirical studies, this concept has not yet fully developed its potential. Often, proponents of the transactional concept actually rely in their research practice exclusively on verbal responses or physiological measures of strain as indicators of stress. By doing so, they implicitly apply the reaction concept. The discrepancy concept describes stress as an incongruity between an individual's desires and the environment (Edwards, 1992); in operationalizing such a discrepancy, however, researchers face great difficulties.

Thus, *stress* is a broad term that conveys a variety of meanings. To avoid ambiguity, we refer to *stressors* and *stress reactions* or *strain* throughout this chapter. We use the terms *strains* and *stress reactions* synonymously.

Stressors

Stressors are conditions and events that evoke strain (Kahn & Byosiere, 1992). Stressors can be single events such as critical

TABLE 18.1 Overview of Stressors in Organizational Life

Physical stressors
Task-related job stressors
Role stressors
Social stressors
Work-schedule-related stressors
Career-related stressors
Traumatic events
Stressful change processes

life events or traumatic experiences, and they can also be chronic problems that continue over a longer period of time. The latter often are microstressors, so-called daily hassles (Kanner, Coyne, Schaefer, & Lazarus, 1981)—for example, daily difficulties with finishing one's work in time or daily problems in dealing with difficult clients.

Stressors can be grouped into the categories *physical stressors, task-related job stressors, role stressors, social stressors, work-schedule-related stressors, career-related stressors, traumatic events,* and *stressful change processes* (Table 18.1).

Physical stressors refer to aversive physical working conditions, including noise, dirt, heat, vibrations, chemical, or toxic substances. They also include poor ergonomic conditions at the workplace and accidents. Physical stressors have psychological effects (Seeber & Iregren, 1992). *Task-related* job stressors appear while the employee is doing a task; these stressors include high time pressure and work overload, high complexity at work, monotonous work, and disruptions (e.g., caused by an unexpected computer shutdown). *Role stressors* fall into role ambiguity and role conflict. *Social stressors* express themselves in poor social interactions with direct supervisors, coworkers, and others. These stressors include interpersonal conflicts at the workplace, (sexual) harassment, and mobbing or bullying (Zapf, Knorz, & Kulla, 1996). Additionally, having to deal with extremely difficult customers can also be conceptualized as social stressor. *Work-schedule-related stressors* stem from working time arrangements. The most prominent and well-researched stressors in this category are night and shift work. Additionally, long working hours and overtime belong to this category (Sparks, Cooper, Fried, & Shirom, 1997). *Career-related stressors* include job insecurity and poor career opportunities. *Traumatic stressors* are single events such as the exposure to disasters, major accidents, or extremely dangerous activities. Soldiers, police personnel, and firefighters are assumed to be particularly prone to the exposure of traumatic stressors (Corneil, Beaton, Murphy, Johnson, & Pike, 1999). *Organizational change* can also be regarded as a stressor. Examples include mergers, downsizing, or the implementation of new technologies. They are stressful because they may result in other stressors such as job insecurity, overtime, and conflicts.

These categories make sense intuitively but largely lack an explicit theoretical foundation. There are only a few theoretically derived taxonomies of stressors. These taxonomies cover parts of potential stressors. Probably the most prominent taxonomy is the delineation of role stressors from role theory (Katz & Kahn, 1978). Role stressors comprise role overload, role conflict, and role ambiguity. Role overload occurs when individuals have to do too much or too complicated work, role conflict refers to situations with conflicting role expectations, and role ambiguity refers to situations with unclear role expectations. Many studies have been conducted on this successful model. Jackson and Schuler (1985) and Tubbs and Collins (2000) meta-analyzed findings from these studies and showed clear relationships between role stressors and impaired well-being.

Semmer (1984) and Leitner, Volpert, Greiner, Weber, and Hennes (1987) proposed a taxonomy of stressors based on action theory (cf. Frese & Zapf, 1994; Hacker, 1998). This taxonomy clusters stressors on the basis of how they disturb the regulation of goal-oriented action. Specifically, this taxonomy differentiates between regulation obstacles, regulation uncertainty, and overtaxing regulations. Regulation obstacles such as interruptions or organizational constraints make action regulation more difficult—if not impossible. Regulation uncertainty refers to uncertainties about how to reach the goal and includes stressors such as lack of appropriate feedback, role conflicts, and role ambiguity. In the case of overtaxing regulation, the speed and intensity of the regulation is the major problem. Typical examples are time pressure and requirement to concentrate. This taxonomy has been successfully used in some studies (e.g., Frese, 1985; Greiner et al., 1997; Leitner, 1993).

There is a long and ongoing debate on objective versus subjective approaches to the study of work stress (Frese & Zapf, 1988; Frese & Zapf, 1999; Kasl, 1998; Perrewé & Zellars, 1999; Schaubroeck, 1999). Often, subjective approaches have been linked to the use of self-report measures, whereas measures not using self-report were labeled objective. However, the distinction between objective and subjective approaches is not such a simple one. Frese and Zapf (1988) suggested another distinction: Objective approaches focus on events, processes, and workplace characteristics that are not related to the job holder's perceptions and that exist regardless of the individual's cognitive and emotional reactions. Subjective approaches in contrast refer to events, processes, and workplace characteristics as perceived and appraised by the job holder. This debate is particularly important with respect to practical implications: It makes sense to

redesign jobs when strains can be attributed to objective stressors and not only to appraisal processes.

Stress Reactions

Stress in organizations affects both the individual and the organization (e.g., increased turnover rates). Individuals can be affected at the physiological, affective, and behavioral level, and in their leisure time and family life. Stressors affect individuals and organizations within different time frames; stress reactions can occur immediately (short-term reactions) or may take longer time to develop (long-term reactions). Table 18.2 gives an overview of stress reactions.

With respect to physiological responses, stress has an effect on the *cardiac system*. For example, individuals in so-called high-strain jobs (i.e., job with high demands and low job control, cf. Karasek, 1979) show blood pressure higher than that of individuals in other types of jobs (Schwartz, Pickering, & Landsbergis, 1996). Furthermore, the heart rate increases in stress situations (Frankenhaeuser & Johansson, 1976). Moreover, experiencing a stressful work situation is associated with increased levels of cholesterol and other metabolic and hemostatic risk factors for cardiovascular disease (Vrijkotte, van Doornen, & de Geus, 1999).

The cardiac system is partly affected by hormones. Stress affects the excretion of *hormones* such as catecholamines and corticosteroids (e.g., cortisol). With respect to catecholamines, it is well documented that the excretion of epinephrine (adrenaline) and norepinephrine (noradrenaline) increases as stress increases (Aronsson & Rissler, 1998; Frankenhaueser, 1979; Frankenhaeuser & Johansson, 1976). The excretion of catecholamines seems to increase most when stressful working conditions are combined with inflexible working arrangements (Johansson, Aronsson, & Lindström, 1978; Melin, Lundberg, Soederlund, & Granqvist, 1999). With increasing work demands, the excretion of cortisol increases (Aronsson & Rissler, 1998). This increase in cortisol is most prominent when stress becomes chronic (Schulz, Kirschbaum, Prüssner, & Hellhammer, 1998). These physiological reactions—particularly the excretion of catecholamines and effects on the cardiac system—help in mobilizing additional effort for completing work assignments and upholding performance (Lundberg & Frankenhaeuser, 1978). However, when experienced repeatedly and over a longer period of time, these physiological reactions may contribute to the development of illnesses, including coronary heart diseases.

TABLE 18.2 Overview of Stress Reactions

	Short-Term Reactions	Long-Term Reactions
Experienced by the individual		
Physical	Physiological reactions	Physical illness
Affective	Disturbed mood	Poor well-being
Behavioral	Cognitive reactions	and mental health
	Increased effort	problems
	Performance decrease[a]	
	Accidents	
Experienced by larger organizational units		
	Interpersonal conflicts	Increased turnover
		Absence rates
Experienced outside work		
	Slow unwinding	Poor well-being
	Spillover of disturbed	in other life
	mood to private life	domains
		Physical illness

[a]Performance decrease was mainly found in laboratory but not in field studies.

Stress also has an effect on the *immune functioning* (Herbert & Sheldon, 1993). Experiencing high levels of stress is detrimental to an individual's immune system. Although the exact underlying processes are still unclear, stress is associated with an increased risk of physical illnesses in the long run. Individuals experiencing high work stress are more likely to develop cardiovascular problems (Schnall, Landsbergis, & Baker, 1994) or musculoskeletal diseases (Bongers, de Winter, Kompier, & Hildebrandt, 1993). The experience of stress is associated with *affective reactions*. In the short term, mood disturbances can occur (Zohar, 1999). Such affective reactions seem to result mainly from specific aversive events and stressful achievement settings (Pekrun & Frese, 1992; Weiss & Cropanzano, 1996). In the long run, well-being and mental health can suffer. Evidence from longitudinal studies suggests that stressful work situations are associated with an increased level of depressive symptoms (Schonfeld, 1992), psychosomatic complaints (Frese, 1985; Parkes, Menham, & Rabenau, 1994) and other distress symptoms (Leitner, 1993). Burnout is another long-term stress reaction. It is characterized by emotional exhaustion, depersonalization (cynicism), and reduced personal accomplishment (Maslach & Jackson, 1981). Burnout has been largely studied in human service and educational occupations, but there is increasing evidence that often members of other occupational groups also react with burnout symptoms to stressful work situations (Maslach, Schaufeli, & Leiter, 2001).

Stressors can also have negative effects on the *behavioral level*. For example, in stressful situations attention is narrowed and working memory capacity is reduced. Moreover, reduced performance accuracy can be observed (Searle, Bright, & Bochner, 1999). When confronted with a stressor, individuals often increase their effort (Hockey, 1997). As a consequence, overall performance does not necessarily suffer from stressful situations (Tafalla & Evans, 1997). Moreover, it has been observed that stressors in the work situation are related to violence such as sabotage, interpersonal aggression, and hostility (Chen & Spector, 1992).

Stressors encountered at work are also related to other aspects of organizational behavior. There is clear evidence that individuals who experience stressors are less committed to the organization (Mathieu & Zajac, 1990). Stressors are associated with turnover intentions (Chen & Spector, 1992) and actual turnover.

Stress experienced at work can also become obvious *outside the work situation*. Mood disturbances associated with stressful working situations generalize to the individual's private life (Doby & Caplan, 1995; Repetti, 1993; Totterdell, Spelten, Smith, Barton, & Folkard, 1995). There is increasing evidence from time sampling studies that mood experienced in one domain (e.g., work) spills over to another domain (e.g., family; e.g., Williams & Alliger, 1994).

Moreover, experiencing a stressful work situation has effects on unwinding processes. For example, Frankenhaeuser (1981) examined adrenaline excretion rates during periods of high workload and showed that adrenaline excretion rates remained elevated during leisure time in the evening. This high level of adrenaline excretion during the evening makes it difficult for individuals to unwind and recover from their stressul work situations (cf. also Meijman, Mulder, & Van Dormolen, 1992, for similar findings).

Additionally, stress reactions might not be limited to the person who him- or herself is exposed to the stressful situation. For example, an observational study showed that mothers' behavior towards their preschool children differed between stressful and unstressful workdays (Repetti & Wood, 1997).

THEORIES ON ORGANIZATIONAL STRESS

Theories can be differentiated in models that describe the stress process itself and models that explain stress reactions—that is, the relationship between stressors and strains. The first type of model describes what happens when an individual is exposed to a stressor, whereas the second type of model specifies configurations of stressors that are associated with strains. Typically, this second type of model neglects process aspects.

It is beyond the scope of this chapter to provide an exhaustive presentation of all theories and models. Instead, we concentrate on those models that have been influential in past theorizing and empirical research and on those that offer promising prospects for future research and practice. Interested readers may refer to Cooper (1998) and Kahn and Byosiere (1992) for descriptions of more models.

Theoretical Models Focusing on the Stress Process

These models aim at a detailed description of what happens during the stress process. Major models in the area are the transactional stress model (Lazarus, 1966; Lazarus & Folkman, 1984) and (other) cybernetic models (Edwards, 1992).

The Transactional Stress Model

One the most prominent stress models is the transactional model by Lazarus (1966; Lazarus & Folkman, 1984). Lazarus and Folkman define psychological stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 19). Thus, Lazarus and Folkman assume that cognitive appraisals play a crucial role in the stress process. Appraisal processes refer to an individual's categorization and evaluation of an encounter with respect to this individual's well-being. Specifically, primary and secondary appraisal can be differentiated. By primary appraisal, encounters are categorized as irrelevant, benign-positive, or stressful. Stress appraisals comprise harm-loss, threat, and challenge. By secondary appraisals, individuals evaluate what can be done in the face of the stressful encounter—that is, they tax their coping options. On the basis of primary and secondary appraisals, individuals start their coping processes that can stimulate reappraisal processes.

To arrive at a better understanding of the stress process and how it develops over time, Lazarus (1991) suggested putting more emphasis on an intra-individual analysis of the stress phenomenon—for example, by studying the same persons in different contexts over time. A few studies followed such an approach (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986); the majority of empirical studies in the area of organizational stress, however, did not adopt such a process perspective, but rather treated stressful situations and individuals' reactions to the situations as stable. Moreover, it has been questioned whether a focus on individual processes offers much to the understanding of workplace stress (Brief & George, 1995).

Cybernetic Model

Edwards (1992) proposed a cybernetic model of organizational stress (for a related model, cf. Cummings & Cooper, 1979, 1998). Edwards summarized earlier approaches to stress that implicitly assumed cybernetic principles (e.g., Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964; McGrath, 1976) and explicitly built on Carver and Scheier's (1982) work on cybernetics as a general theory of human behavior. Crucial components in Carver and Scheier's model are an input function, a reference value, a comparator, and an output function. The input function refers to perceptions of one's own state or of situational features in the environment. The

reference value comprises the individual's desires, values, or goals. The comparator compares the input function with the reference value. The output function refers to behavior that is activated when a discrepancy between the input function and the reference value is detected.

Edwards (1992) defines stress as "a discrepancy between an employee's perceived state and desired state, provided that the presense of this discrepancy is considered important by the employee" (p. 245). Thus, stress occurs when the comparison between an individual's perception and his or her desire results in a discrepancy. The perception is assumed to be influenced by the physical and social environment, personal characteristics of the individual, the individual's cognitive construction of reality, and social information. The discrepancy between perception and desires (i.e., stress), affects two outcomes: the individual's well-being and his or her coping efforts. Additionally, reciprocal effects between well-being and coping are assumed. Moreover, coping may have an effect on the person and the situation, the individual's desires, and the duration of the stressful situation and the importance attached to it. The effects of the discrepancy on well-being and coping efforts are moderated by additional factors such as the importance of the discrepancy and its duration.

Although there is empirical research on isolated aspects of the cybernetic model (e.g., on the effects of discrepancies between perceptions and desires on well-being (cf. Edwards, 1991), to our knowledge, no study on organizational stress has yet examined the cybernetic framework as a whole. One reason is that it is difficult to examine the crucial assumptions of this model in one single study. Such a study must include separate measures of perceptions, desires, importance, duration, well-being, and coping. The greatest challenge will be to design nonconfounded measures of individual perception, objective characteristics of the environment, the individual's cognitive construction of reality, and social information processes.

Theoretical Models on the Relationship Between Stressful Situations and Strains

These models specify the configuration of workplace factors that are associated with strains—that is, stress reactions. Major models include the person-environment fit theory (Harrison, 1978), job demand-job control model (Karasek, 1979), the vitamin model (Warr, 1987) and the effort-reward imbalance model (Siegrist, 1996).

Person-Environment Fit Theory

Person-environment (P-E) fit theory assumes that stress occurs because of an incongruity between the individual and the environment (for an overview, cf. Edwards, 1998; Harrison, 1978). Thus, it is neither the person nor the situation alone that causes stress experiences and strains. There are two types of incongruity between an individual and the environment. The first type refers to the fit between the demands of the environment and the abilities and competencies of the persons. The second type refers to the fit between the needs of the person and supplies from the environment.

At the conceptual level, P-E fit theory differentiates between the objective and the subjective person as well as between the objective and the subjective environment (Harrison, 1978). *Objective person* and *objective environment* refer to the individual needs, abilities, and competencies and to environmental supplies and demands as they actually exist—that is, independent of the person's perceptions. *Subjective person* and *subjective environment* refer to the individual's perceptions. Therefore, fit can refer to the congruence between (a) objective environment and objective person, (b) subjective environment and subjective person, (c) subjective and objective environment (i.e., contact with reality) and (d) subjective and objective person (i.e., accuracy of self-assessment).

The theory argues that the objective person and environment affect the subjective person and environment and that incongruity between the subjective environment and the subjective person produces strain. Strain increases as demands exceed abilities and as needs exceed supplies. When abilities exceed demands, strain may increase, decrease, or remain stable. Similarly, when supplies exceed needs, strain may increase, decrease, or remain stable. The exact picture of the relationships depends of the content and importance of the dimension in question.

In a classic study, French, Caplan, and Harrison (1982) explicitly tested P-E fit theory. Indeed, P-E misfit was associated with psychological, physical, and biological strains. Subsequent studies on P-E fit resulted in similar findings and identified a needs-supplies incongruity as the strongest predictor of strain (Edwards, 1991). However, many of these studies have been criticized for methodological shortcomings, particularly the operationalization of P-E fit as a difference score (Edwards, 1995). More recent studies—most of them published after 1990—overcame these problems by examining three-dimensional relationships of the person and environment with strain measures. These studies partially confirmed the basic assumption of P-E fit theory—that is, that strain increases as fit between the person and his or her work environment decreases (Edwards, 1996; Edwards & Harrison, 1993). These studies also pointed to complex patterns including curvilinear relationships; taken together, the studies do provide some empirical support for the P-E fit model. However,

longitudinal studies are still missing. Therefore, a final conclusion about this model would be premature.

Job Demand-Job Control Model

The job demand-job control model differentiates between two basic dimensions of work place factors—namely, job demands and job decision latitude (Karasek, 1979). Job demands are the workload demands put on the individual. Job decision latitude refers to the employee's decision authority and his or her skill discretion. Karasek combined the two dimensions of job demands and job decision latitude in a two-by-two matrix of jobs: jobs low on demands and low on decision latitude (*passive* jobs), jobs low on demands and high on decision latitude (*low-strain* jobs), jobs high on demands and low on decision latitude (*high-strain* jobs) and jobs high on demands and high on decision latitude (*active* jobs).

With respect to stress reactions, Karasek (1979) states that the combination of high demands and low decision latitude in the high-strain jobs is most detrimental for people's health and well-being. The combination of high demands and high decision latitude in the active jobs, however, are assumed to produce little harm for the individual. Stated differently, the model basically assumes that high decision latitude attenuates the negative effects of high demands.

During the past two decades, the job demand-job control model stimulated a large amount of empirical research. There is substantial (although not unequivocal) support for the model. We discuss findings from this research in more detail later in this chapter. A theoretical critique is given by Kasl (1996).

Vitamin Model

Warr (1987) proposed a vitamin model to specify the relationships between stressors and employee health and well-being. The vitamin model claims nonlinear relationships develop between work characteristics and individual outcomes. Drawing an analogy to the effects of vitamins on the human body, Warr assumes that there are two types of work characteristics. First, some features of the work situation have a constant effect on the individual—that is, they have an effect that increases up to a certain point, but then any added increase of the level of this work characteristic does not have any further effects (neither beneficial nor detrimental effects). Warr likens these effects to characteristics to vitamin C. Examples are salary, safety, and task significance. For example, people need the vitamin of salary up to a certain point. Therefore, people's well-being increases with having more income; at a certain level, however, any additional salary increase will not have any further increase of people's well-being. Second, other work features have a curvilinear relationship between the level of this work characteristic and well-being. Warr likens these to the vitamin D, which is positive to a certain dose, but then every further increase has a negative effect. Examples of these work features are job autonomy, social support, and skill utilization. For example, a low degree of job autonomy is detrimental to well-being. Therefore, up to a certain level, job autonomy increases well-being. If job autonomy is further increased, job autonomy becomes negative because people are overwhelmed with the responsibilities that job autonomy implies.

In terms of stress, this model implies that a specific amount of job autonomy, job demands, social support, skill utilization, skill variety, and task feedback is beneficial for the individual, but a very high level of these job characteristics creates a stressful situation. In contrast, high levels of salary, safety, and task significance do not show this detrimental effect.

Empirical studies on the vitamin model are still rare, and support for the curvilinear relationships between workplace factors and strain variables is mixed. Some studies did not find any significant curvilinear relationship (e.g., Parkes, 1991), whereas others gave support to the vitamin model (e.g., de Jonge & Schaufeli, 1998; Warr, 1990). Warr found curvilinear relationships between job demands and several strain measures such as job-related anxiety, job-related depression, and low job satisfaction; a curvilinear relationship was also found between autonomy and job satisfaction. De Jonge and Schaufeli (1998) found evidence for curvilinear relationships between job demands, job autonomy, and social support on the one hand and employee well-being on the other hand.

Effort-Reward Imbalance Model

A variant of a P-E fit model is Siegrist's (1996) effort-reward imbalance model. Basically, the effort-reward imbalance model assumes that a lack of reciprocity between costs and rewards are experienced as stressful and result in strains. More specifically, the model states that the degree to which an individual's efforts at work are rewarded or not is crucial for that person's health and well-being. Effort may be the response to both extrinsic and intrinsic demands. Extrinsic demands refer to obligations and demands inherent in the situation. Intrinsic demands result from a high need for control or approval. Rewards comprise money, esteem, and status control, such as job stability, status consistency, and career advancement. In essence, the model assumes that situations in which high efforts do not correspond to high rewards result in emotional distress situations—particularly high autonomic arousal.

A number of studies showed that a combination of high effort and low reward predicted self-reported health

complaints, cardiovascular risk factors, and manifestations of coronary heart disease (Bosma, Peter, Siegrist, & Marmot, 1998; de Jonge, Bosma, Peter, & Siegrist, 2000; Peter, Geissler, & Siegrist, 1998; for a summary cf. Siegrist, 1998). Most interesting is that a longitudinal study with blue-collar workers showed that experiencing an effort-reward imbalance was associated with 6.15 times the risk of developing coronary heart disease 6.5 years later (Siegrist, Peter, Junge, Cremer, & Seidel, 1990; cf. also the similar results by Bosma et al., 1998).

Comparison of Models

Unfortunately, there are few empirical studies that directly compare different models; this is unfortunate because only a direct comparison can tell which theories are superior. Moreover, modern analysis methods—like structural equation analysis—allow and encourage such comparisons. For example, Elsass and Veiga (1997) tested the job demand-job control model and the P-E fit model with the same sample. Their data supported the P-E fit model, but not the job demand-job control model. Similarly, de Jonge et al. (2000) compared the job demand-job control model and the effort-reward imbalance model. These authors also reported better fit indexes for the effort-reward imbalance model than for the job demand-job control model. This might suggest that the P-E fit and the effort-reward imbalance models are superior to the job demand-job control model in explaining employee well-being. In the future, more such analyses are needed.

EMPIRICAL EVIDENCE

Main Effects of Stressful Situations on Individual Well-Being and Health

There is consistent evidence that perceived stressors at work are related to indicators of poor health and well-being (for meta-analyses, cf. Jackson & Schuler, 1985; Lee & Ashforth, 1996). However, most of these studies are cross-sectional in nature and based on same-source self-report measures. Many researchers criticized these predominant features of organizational stress research (Frese & Zapf, 1988; Kasl, 1978; Zapf, Dormann, & Frese, 1996). Cross-sectional designs allow no inference about causality, empirical relationships between stressors and strains might be due to third variables such as social class or negative affectivity, and strains may affect stressors—for example, in the sense of the drift hypothesis. A drift hypothesis implies that individuals with poor health are unable to retain favorable working conditions in the long run, whereas healthier individuals are promoted into better—that is, less stressful—jobs (Frese, 1985). Health and well-being might also affect the perception of stressors because individuals with poor health overestimate the stressfulness of their jobs (Zapf, 1989). Additionally, same-source measures often used in organizational stress research share common method variance and therefore may result in an overestimation of true relationships.

Evidence From Studies With Objective Measures of Stressors

To examine whether the relationship between stressors and strains can be primarily explained by the use of self-report measures and the associated methodological problems, studies are needed in which stressors are assessed by non-self-report measures. There is an increasing number of such studies. In some of these studies, researchers inferred objective stressors from occupational titles and similar information. Analyses revealed significant relationships between stressful jobs and poor health and well-being. For example, Tsutsumi, Theorell, Hallqvist, Reuterwall, and de Faire (1999) reported increased odd ratios of plasma fibrinogen concentrations—a physiological indicator assumed to be associated with coronary heart disease—in study participants working in highly demanding jobs.

Other researchers assessed objective stressors by means of observations. These studies also showed association between objective stressors and impaired health and well-being. For example, Frese (1985) found correlations of $r = .18$ and $r = .19$ between observer ratings of psychological stressors and psychosomatic complaints. Melamed et al. (1995) measured monotony with observational ratings and found that short-cycle and medium–cycle repetitive work was significantly associated with psychological distress, particularly in women. Greiner et al. (1997) reported increased odd ratios of psychosomatic complaints in observed high-stress jobs.

In summary, these findings show that stressors at work are related to poor health and well-being—even when objective measures of stressors are used. Often the correlations between objective stressor measures and strains are smaller in size than are the correlations between self-report measures of stressors and strains (cf. Frese, 1985), but they do not break down completely; this suggests that common method variance inflates the relationships between self-reported stressors and self-reported strains, but it does not fully explain the empirical relationship between organizational stressors and strains. For methodological reasons, the correlations found between objective stressors and self-reported strains

present the lower boundary of the stressor-illness relationships (Frese, 1993).

Evidence From Longitudinal Studies

To arrive at a clearer picture about the causal processes between stressors and strains, longitudinal studies are needed. Although they do not solve all the methodological problems (Zapf, Dormann, et al., 1996), they at least allow researchers to rule out some of the alternative interpretations. Table 18.3 gives an overview over longitudinal studies published between 1981 and 2000 that meet the following criteria: (a) data collection on work-related stressors and strains and (b) control for initial level of strains in the analyses.

Table 18.3 shows the number of time lags, the time interval between the various measurement points, sample size, type of stressors assessed, type of strains assessed, results with respect to lagged effects, concurrent effects, reverse effects (i.e., effects of strains on stressors), and nonsignificant findings. Most of the studies assessed data at two measurement points. Time lags ranged between 1 month and 180 months, with most studies using time lags of 12 months or less. A wide range of stressors were assessed, including workload, social stressors, and job insecurity. Also strain measured covered a large variety of indicators, including physiological measures, distress symptoms, depression, psychosomatic complaints, and physical illnesses. Most researchers analyzed their data with variants of cross-lagged panel correlations (CLPC), multiple regression analyses, or structural equation approaches (e.g., LISREL).

We discuss the study findings separately for concurrent, lagged, and reverse effects. Concurrent effects refer to synchronous effects of stressors (Time 2) on strain (Time 2) with controlling for strain (Time 1). Lagged effects imply effects of stressors (Time 1) on strain (Time 2) when controlling for strain (Time 1). Reverse effects refer to effects of strains (Time 1) on stressors (Time 2) with controlling for stressors (Time 1; drift hypothesis).

Most studies that examined *concurrent effects* focused on psychological strains (exceptions: Howard, Cunningham, & Rechniter, 1986; Spector, Chen, & O'Connell, 2000, which looked at physiological strain). About half of the studies found concurrent effects of all measured stressors on strains. The other half of the studies found support for relationships between some combinations of stressors and strains. Stressors with concurrent effects on strains included workload, role conflicts, and role ambiguity. Strains affected were depressive symptoms, burnout, and fatigue spillover into leisure time. There was no systematic pattern of stressor-strain relationships for which concurrent effects were found.

Studies that addressed *lagged effects* of stressful work situations examined both psychological and physical strain symptoms. Psychological symptoms included strains such as distress, anxiety, depressive symptoms, and exhaustion. Physical symptoms included mainly (psycho)somatic health complaints, cardiovascular disease, and other illnesses. Lagged effects of stressors on psychological strain symptoms appeared in more than half of the studies, at least for some of the stressors or strains tested. Significant effects were more often found when stressors such as high demands and high workload were examined (as opposed to social stressors), when the time lag was relatively short (not longer than 12 months), and when no concurrent effects were tested simultaneously.

There is rather strong evidence that stressors at work have a lagged effect on physical strain symptoms, particularly (psycho)somatic health complaints (Carayon, 1993; Frese, 1985; Leitner, 1993; Parkes et al., 1994; for an exception, cf. Mauno & Kinnunen, 1999). Stressors have lagged effects on cardiovascular disease, particularly in men (Hibbard & Pope, 1993; Karasek, Baker, Marxner, Ahlbom, & Theorell, 1981). However, stressors seems to have none or only a minor lagged effect on other illnesses such as cancer (Hibbard & Pope, 1993). Taken together, these longitudinal studies suggest that there are lagged effects of stressors on strains, particularly if the time lag between two measurement points does not exceed 12 months.

Most of the studies tested either concurrent or lagged effects. The majority of these studies found evidence for an effect of stressors on strains, at least for some of the stressor or strain indicators. There are only a few studies that analyzed both lagged and concurrent effects within the same data set (Glickman, Tanaka, & Chan, 1991; Kohn & Schooler, 1982; Moyle, 1998; Roy & Steptoe, 1994; Schonfeld, 1992; Wolpin, Burke, & Greenglass, 1991). All these studies found concurrent effects (at least for some of the indicators). However, half of the studies failed to find lagged effects when concurrent effects were present. Only Wolpin et al. (1991), Schonfeld (1992), and Moyle (1998) reported lagged effects in the presence of concurrent effects. These findings indicate that individuals develop distress reactions to stressful situations rather quickly; this implies that having experienced stressful work situations in the past may have little effect on one's psychological well-being unless the stressful situation continues into the present. We assume, however, that the situation is different for physical symptoms. More studies on physical indicators are needed that examine concurrent and lagged effects simultaneously.

TABLE 18.3 Longitudinal Studies on Stressors, Well-Being, and Health

Study	Number of Waves	Time Lags	Sample Size	Statistical Procedure	Stressors	Strains	Third Variables	Lagged Main Effects	Concurrent Main Effects	Reverse Effects	Effects Tested But Not Found
Bakker, Schaufeli, Sixma, Bosveld, & van Dierendonck (2000)	2	60	207	LISREL	Patient demands	Burnout	—	Not tested	Patient demands ↗ emotional exhaustion; effects on other burnout components are mediated by emotional exhaustion	Depersonalization ↗ patient demands	—
Begley & Czajka (1993)	2	3	82	Multiple regression	Experienced stressfulness of organizational change	Job displeasure	Age, gender, marital status, education, organizational tenure, NA, organizational commitment	Not tested	Experienced stressfulness ↗ job displeasure	Not tested	—
Bromet, Dew, Parkinson, & Schulberg (1988)	2	12	322–325	Multiple regression, Logistic regression	Job demands	Affective disorders, alcohol-related problems, distress symptoms	Age, coworker support, friendship support	Job demands ↗ affective disorders; Job demands ↗ distress symptoms ($p < .10$)	Not tested	Not tested	No effect of job demands on alcohol-related problems
Carayon (1993)	2	12	122	CRPC	Workload	Daily life stress, physical health complaints	Not tested in CLPC	Workload ↗ physical health complaints	Not tested	No reverse effects	No lagged effect of workload on daily life stress
Chapman, Mandryk, Frommer, Edye, & Ferguson (1990)	3	36 + 24	2,634	Multiple regression	Quantitative demands, qualitative demands, outside stress	Systolic blood pressure, diastolic blood pressure	Age, education, weight, fitness, alcohol consumption, family history, etc.	Young women: Quantitative demands ↗ diastolic blood pressure	** chronicity scores: mixture of lagged and concurrent effects	Not tested	No effects on systolic blood pressure; no effects for men; no effects for all women together
Daniels & Guppy (1994)	2	1	244	Multiple regression	Various stressors	Well-being	No	Not tested	Stressors ↘ well-being	Not tested	
Dormann & Zapf (1999)	3	4 + 8	202	LISREL	Social stressors	Depressive symptoms	—	No effect of social stressors	Not tested	Not tested	No effect of social stressors
Frese (1985)	2	16	53–79	CLPC	Psychological stressors	Psychosomatic complaints	Not tested in CLPC	Psychological stressors ↗ psychosomatic complaints	Not tested	No reverse effects	No effect when observational measure of stressors was used

Garst, Frese, & Molenaar (2000)	6	4, 10, 12, 12, 24	448	Growth curve model	Job insecurity, time pressure, organizational problems, social stressors, uncertainty	Depression, psychosomatic complaints, irritation, worrying	Not in growth curve model	Uncertainty ↗ depression, psychosomatic complaints, irritation, worrying; social stressors ↗ psychosomatic complaints, worrying	Stressors ↗ strains	Strains ↘ Stressors	No lagged effects of job insecurity
Glickman, Tanaka, & Chan (1991)	2	17	2,506	LISREL	Work load and economic strain	Distress	Age, life events	No lagged effect of workload and economic strain on distress	Workload and economic strain ↗ distress	Distress ↗ workload and economic strain (lagged)	No lagged effect of workload and economic strain on distress
Hibbard & Pope (1993)	2	180	2,157	Prospective design	Work stress	Ischiamic heart disease (IHD), malignancy, stroke, death	Age, education, self-reported health, marital and parental roles	Men: work stress ↗ IHD	Not tested	Not applicable	No effects for women; no effects on malignancy, stroke, or death
Howard, Cunningham, & Rechniter (1986)	2	24	217	Multiple regression	Role ambiguity	Systolic blood pressure, diastolic blood pressure, cholesterol, triglycerides, uric acids	Hardiness		Type A individuals: change in role ambiguity ↗ systolic blood pressure, diastolic blood pressure, triglycerides		No effects for Type B individuals; no effects on cholesterol and uric acids
Karasek, Baker, Marxner, Ahlbom, & Theorell (1981)	2	72	1,461	Logistic regression	Job demands	Cardiovascular disease	Age, intelligence discretion, personal schedule freedom, education, smoking, overweight	Job demands ↗ cardiovascular disease	Not tested	Not applicable	—
Kohn & Schooler (1982)	2	120	687	LISREL	Time pressure, heaviness, dirtiness, hours of work	Distress	—	No lagged effects on distress	Dirtiness ↗ distress; hours of work ↘ distress	Distress ↗ time pressure (concurrent); distress ↘ heaviness (lagged)	No effects of time pressure and heaviness on distress; no lagged effects of dirtiness and hours of work on distress

(*Continued*)

TABLE 18.3 (*Continued*)

Study	Number of Waves	Time Lags	Sample Size	Statistical Procedure	Stressors	Strains	Third Variables	Lagged Main Effects	Concurrent Main Effects	Reverse Effects	Effects Tested But Not Found
Lee & Ashforth (1993)	2	8	169	LISREL	Role stress	Emotional exhaustion (EE); depersonalization, personal accomplishment	No	Lagged effects not testable effect of role	Role stress ↗ emotional exhaustion; stress on depersonalization and personal accomplishment mediated by EE	Not tested	
Leitner (1993)	3	12 + 12	222	CLPC	Barriers in work process	Psychosomatic complaints, irritation, strain, depression, anxiety, somatic symptoms	—	Barriers ↗ psychosomatic complaints, irritation, strain, depression, somatic symptoms, illness	Not tested	No reverse effect	No effect on anxiety or illness
Mauno & Kinnunen (1999)	2	12	219	LISREL	Job insecurity	Exhaustion, somatic symptoms, spillover into parenthood	No	Women: job insecurity ↗ exhaustion; job insecurity ↗ spillover	Not tested	No reverse effects	No effects for men; no effects on somatic symptoms
Mohr (2000)	2	84	62–65	Partial correlations	Job insecurity	Irascibility, anxiety, psychosomatic complaints, depression	—	Not tested	Job insecurity ↗ anxiety; job insecurity ↗ psychosomatic complaints	Not tested	No effects on irascibility and depression
Moyle (1998)	3	7 + 5	148	LISREL	Demands	Distress (GHQ)	Neuroticism	Demands ↗ distress	Demands ↗ distress	Distress ↘ demands	
Moyle & Parkes (1999)	3	2.5 + 6	85	Multiple regression	Demands relocation	Distress (GHQ)	Not entered into regression equation before other variables	Not tested	Demands ↗ distress	Not tested	Relocation per se does not affect distress
Muntaner, Tien, Eaton, & Garrison (1991)	2	12	11,789	Prospective	Psychological demands, physical demands	Psychotic disorders (delusions, schizophrenia, psychotic affective)	—	Physical demands ↗ delusions, psychological demands ↘ schizophrenia	Not tested	Not applicable/ not tested	No effects on psychotic-affective disorders, no effect of psychological demands on delusions, effect of physical demands on schizophrenia marginally significant (↗)

Nelson & Sutton (1990)	3	6 + 3	91	Multiple regression	Chronic stressors	Distress symptoms	Coping	Chronic stressors ↗ distress symptoms (3-month time lag)	Not tested	Not tested	—
Newton & Keenan (1990)	2	24	247	Multiple regression	Role conflict, role ambiguity, quantitative high load, qualitative low load	Job dissatisfaction, anxiety, anger, frustration, hostility	—	Not tested	Δ role conflict ↗ job dissatisfaction, anxiety, anger, frustration, hostility; Δ role ambiguity ↗ job dissatisfaction, anxiety, anger, frustration, hostility; Δ quantitative high load ↗ anxiety; Δ quantitative high load ↘ job dissatisfaction, anger; Δ qualitative low load ↗ job dissatisfaction, anger, frustration, hostility	Not tested	Quantitative high load has no effect on frustration or hostility; qualitative low load has no effect on anger
Noor (1995)	2	8	180	Multiple regression	Role overload	GHQ scores, happiness	Age, NA	Not tested	Role overload ↗ GHQ scores	Not tested	No effect on happiness
Parkes (1991)	2	4	147	Multiple regression	Demands (i.e., time pressure)	Anxiety	Age, gender, discretion, locus of control, social dysfunctioning	Demands ↗ anxiety	Not tested	Not tested	—
Parkes, Menham, & von Rabenau (1994)	2	2	180	Multiple regression	Demands	Somatic symptoms	Gender, age, neuroticism	Demands ↗ somatic symptoms	Not tested	Not tested	—
Revicki, Whitley, Gallary, & Allison (1993)	3	12 + 12	369 (1st time lag); 192 (2nd time lag)	Multiple regression	(low) Role clarity	Depressive symptoms	Age, gender, marital status, other strain symptoms	No effects	Not tested	Not tested	No effects
Roy & Steptoe (1994)	4	3 + 3 + 3	48	Multiple regression	Daily stressors	Depression	NA, social support	No lagged effects	Daily stressors ↗ depression for all three time lags	No reverse effects	No lagged effects

(*Continued*)

TABLE 18.3 (*Continued*)

Study	Number of Waves	Time Lags	Sample Size	Statistical Procedure	Stressors	Strains	Third Variables	Lagged Main Effects	Concurrent Main Effects	Reverse Effects	Effects Tested But Not Found
Rydstedt, Johansson, & Evans (1998)	2	18	52	Multiple regression	Workload	Perceived effort, fatigue spillover, intake of stress-related drugs	Gender	Not tested	Delta-workload ↗ perceived efforts, fatigue spillover	Not tested	
Schonfeld (1992)	2	Approx. 6	255	LISREL	Episodic and chronic stressors	Depressive symptoms	No control variables in LISREL models	Stressors ↗ depressive symptoms	Stressors ↗ depressive symptoms; concurrent models fits the data better than lagged model	No reverse effects	
Shirom, Westman, Shamai, & Carel (1997)	2	24–36	665	Multiple regression	Overload	Cholesterol triglycerides	Age, body mass index, emotional reactivity, burnout, fatigue	Women; Overload ↗ cholesterol	Not tested		No effects in men; no effect on triglycerides
Siegrist, Peter, Junge, Cremer, & Seidel (1990)	2	66	263	Logistic regression	Status inconsistency, job insecurity, work pressure	Ischiamic heart disease (IHD)	Age, body mass index, blood pressure, cholesterol, coping	Status inconsistency ↗ IHD, job insecurity ↗ IHD, work pressure ↗ IHD	Not tested	Not applicable	—
Spector, Chen, & O'Connell (2000)	2	Approx. 12	110	Partial Korr	Interpersonal conflict constraints, role ambiguity, role conflict, workload	Anxiety, frustration, job satisfaction, physical symptoms	NA	Not tested	All stressors ↗ anxiety and frustration, role ambiguity and role conflict ↘ satisfaction	Not tested	No effect on physical symptoms
Tang & Hammontree (1992)	2	6	60	Multiple regression	Stressors in police jobs	Illness	Hardiness	Stressors ↗ illness	Not tested	Not tested	—
Wolpin, Burke, & Greenglass (1991)	2	12	262	Multiple regression	Various stressors	Burnout, job satisfaction	—	Stressors ↘ job satisfaction	Stressors ↘ job satisfaction, stressors ↗ burnout	Not tested	No lagged effects on burnout
Zapf & Frese, (1991)	2	16	89	CLPC	Social stressors	Psychosomatic complaints, irritation, strain, anxiety, depression	Not in CLPC	No lagged effects	Not tested	No reverse effects	No lagged effects

Note. Time lags refer to months. CLPC = cross-lagged panel correlation. NA = negative affectivity.

A growing number of studies have tested *reverse effect*. These studies addressed the question of whether strains lead to an increase in stressors as suggested in the drift hypothesis (cf. Zapf, Dormannn, et al., 1996). In 9 out of 12 studies, no such reverse effects were found (Carayon, 1993; Frese, 1985; Garst et al., 2000; Leitner, 1993; Mauno & Kinnunen, 1999; Moyle, 1998; Roy & Steptoe, 1994; Schonfeld, 1992; Zapf & Frese, 1991). Three studies reported reverse effects for (some of the) strain symptoms on (some of the) stressors (Bakker et al., 2000; Glickman et al., 1991; Kohn & Schooler, 1982). It is interesting to note that in most of the studies that found such reverse effects, both types of effects were present—effects of stressors on strains *and* effects of strains on stressors. This suggests that—at least for some individuals—experiencing organizational stress may be linked to a negative spiral: Stressors increase strain, which in turn increases stressors. Moyle (1998) and Garst et al. (2000), however, found an effect opposite to the drift hypotheses (a sort of refuge model). People with high strain eventually received workplaces that had fewer demands and stressors.

In summary, there is good and increasing evidence that stressors at work have a causal effect on health and well-being. The support for concurrent effects is stronger than for lagged effects, at least for psychological strains. Consistent lagged effects were mainly found for physical strain symptoms. This implies that an individual's present work situation seems to be more relevant for developing psychological disturbances, whereas an individual's past work situation may also have long-term effects on his or her physical health and well-being. Clearly more research is needed that examines concurrent versus lagged effects more systematically. Moreover, more attention should be paid to the time intervals at which data are gathered (cf. Dormann & Zapf, 1999). Differential effects of different stressors and different models of stressor-strain relationships should be examined (Frese & Zapf, 1988; Garst et al., 2000).

The Role of Resources

Stressors do not necessarily have a negative effect on the individual. The degree to which a stressful work situation affects the individual might be contingent on the availability of resources. Hobfoll (1998) defines resources as "objects, conditions, personal characteristics, and energies that are either themselves valued for survival, directly or indirectly, or that serve as a means of achieving these ends" (p. 54). With respect to organizational stress, resources refer to conditions within the work situation and to individual characteristics that can be used to attain goals. Both with respect to the advancement of stress theory and practical implications, it is highly relevant to establish whether these resources buffer (i.e., moderate) the effects of stressors on strains.

Resources at work most often studied were control at work and social support. Individual resources are coping styles, locus of control, self-efficacy, and competence. Additionally, we shall briefly refer to other factors such as Type A behavior pattern, hardiness, and sense of coherence.

Control at Work

Control at work refers to an individual's opportunity to influence one's activities in relation to a higher-order goal (Frese, 1989). P. R. Jackson, Wall, Martin, and Davids (1993) differentiated between control over timing and methods to do the work. Many studies addressed the question of whether high control at work buffers the negative effects of a stressful work situation on an individual's health and well-being. Most of these studies have been conducted within the framework of Karasek's (1979) job demand-job control model.

Epidemiological studies on cardiovascular diseases an as outcome variable tended to confirm the major assumptions of Karasek's model (for reviews, cf. Kristensen, 1995; Schnall et al., 1994; Theorell & Karasek, 1996). Individuals in high-strain jobs often suffered from cardiovascular illnesses. Moreover, in about half of the studies, high-strain jobs were associated with cardiovascular risk factors such as high blood pressure and smoking (Schnall et al., 1994).

With respect to other outcomes including psychological well-being and mental health, the findings are less conclusive. Several reasons for these inconsistent findings can be mentioned. *First,* there are many studies that did not explicitly test the interaction effect but that compared high demands-low control subgroups (i.e., high-strain jobs) with high demands-high control subgroups (i.e., active jobs). This comparison often revealed significant differences in health and well-being between high-strain jobs and active jobs (e.g., Eriksen & Ursin, 1999; Landsbergis, 1988). Theorell and Karasek (1996) have recently suggested that this procedure be used in general (for a critique, cf. Kasl, 1996).

In a qualitative review of empirical studies on the job demand-job control model published between 1979 and 1997, Van der Doef and Maes (1999) examined whether individuals in high-strain jobs experience poorer psychological well-being than do individuals in other jobs. Their review revealed that in 28 of the 41 studies with general psychological well-being as dependent variable, individuals in high-strain jobs indeed showed the lowest well-being scores. For job-related well-being such as job satisfaction, burnout, and job-related mood as dependent variables, a similar picture emerged. Strictly speaking, such a comparison between high-strain jobs

and other jobs examines the main effects of job demands and job control—not the hypothesized interaction effect. When testing the interaction effect with the more appropriate moderated regression analysis, the job demand-job control model was supported less frequently. Some researchers reported support for the model (Fox, Dwyer, & Ganster, 1993; Sargent & Terry, 1998), whereas others did not (Landsbergis, 1988; Schaubroeck & Fink, 1998).

In the aforementioned review by Van der Doef and Maes (1999), 8 of 31 studies showed (partial) evidence for the interaction effect. An additional seven studies confirmed the interaction effect for subgroups of individuals, dependent on their personality, type of organization, and hierarchical position. A more recent study found support for the postulated interaction effect when using a multilevel analysis approach (VanYperen & Snijders, 2000). It is noteworthy that significant interaction effects were also found in longitudinal studies (Parkes et al., 1994; Sargent & Terry, 1998).

A *second* reason for failing to find the postulated interaction effect between demands and control may lie in the operationalization of the core variables. For example, Wall et al. (1996) argued that Karasek's (1979) measure of decision latitude (used in many studies) is a conglomerate of many aspects of control such as decision over working methods, decision over scheduling of one's tasks, aspects of skill use, and task variety. Probably only proper job control attenuates the negative effects of high demands, whereas skill use and task variety do not. Wall et al. (1996) tested this assumption explicitly and found the hypothesized interaction effect for a relatively narrow job control measure but not for the broader decision latitude measure (for similar findings, cf. De Croon, Van der Beek, Blonk, & Frings-Dresen, 2000; Sargent & Terry, 1998).

A *third* reason for the inconsistent findings on the job demand-job control model lies in the effects of additional variables such as social support or self-efficacy. For example, Johnson and Hall (1988) incorporated social support into the model. This extended demand-control-support model showed social support to buffer the negative effects of the combination of high demands and low control. Stated differently, the detrimental effects of a high-strain job unfolded only when social support was low but not when social support was high. Thus, a three-way interaction was found.

Van der Doef and Maes (1999) suggested that field studies that tested the hypothesized three-way interaction—and that controlled for main effects and two-way interactions—resulted in inconclusive findings. For example, Parkes et al. (1994) reported support for the demand-control-support model. Most studies found no evidence for a three-way interaction between demands, control, and support (Dollard et al., 2000; Furda et al., 1994; Melamed, Kushnir, & Meir, 1991; for a summary, cf. Van der Doef & Maes, 1999). Some authors even reported findings that cast doubt on the predictions of the demands-control-support model (Landsbergis, Schnall, Deitz, Friedman, & Pckering, 1992; Schaubroeck & Fink, 1998). Recent research suggests even more complex interactions and stresses the importance of coping (Daniels, 1999).

Fourth, Warr (1987) and Frese (1989) have argued that at work it should be very difficult to find interaction effects of stressors and control: Control implies that people can do something about the stressors. If people are bothered by stressors, they reduce the stressors; but they can only reduce stressors if they have control. If stressors continue to exist, it may be because they are noncontrollable by definition. Because noncontrollability and stressors are intertwined, it is difficult to show an interaction effect. It should be much easier to find an interaction effect if people are confronted with a new situation, such as in an experiment.

Fifth, experimental research tends to support the job demand-job control model. In such experiments, interaction effects of perceived demands and perceived control on dependent measures such as anxiety, task satisfaction, and subjective task performance were found (Jimmieson & Terry, 1997; Perrewé & Ganster, 1989), although there is also disconfirming evidence (Perrewé & Ganster, 1989; Searle et al., 1999). There is a large body of literature on the learned helplessness paradigm (Seligman, 1975), which also posits an interaction effect of stressors and control. Experimental research in this tradition has repeatedly replicated the interaction effects of bad events and noncontrol on reduction in well-being (Peterson, Maier, & Seligman, 1993).

In summary, there is strong empirical evidence for the additive main effect of job demands and job control. Individuals in high-strain jobs show the lowest well-being scores and suffer most from illnesses. However, the interaction effect has received far less support. Adequate operationalization of job control may be crucial for finding significant interaction effects. Experimental findings tended to support the helplessness concept with its interaction effects of stressors and noncontrol. In all, Karasek's (1979) model has contributed to a fair amount of empirical controversy that has been fruitful. Given the previous arguments and the experimental findings, the fact that noncontrol and stressors produce at least additive effects and that a number of field studies find an interaction effect after all, we tend to think that Karasek's model has not done that badly.

Social Support and Work Group Factors

Social support is important for protecting an individual's health and well-being. It can be characterized as resources provided by others (Cohen & Syme, 1985) and comprises emotional,

informational, and instrumental (i.e., tangible) support (House, 1981). In general, the literature assumes that the beneficial effect of social support works both via main and interaction effects. A recent meta-analysis based on a total of 68 effect sizes addressed the main effect and has shown that social support is negatively associated with strains (Viswesvaran, Sanchez, & Fisher, 1999). We find it interesting that social support was also negatively related to stressors at work.

With respect to the interaction effect, Cohen and Wills (1985) pointed out that social support functions only as a buffer in the stressor-strain relationship if the available support matches "the specific need elicited by a stressful event" (p. 314). A number of cross-sectional studies suggest that social support buffers the negative effects of stressors (for a review, cf. Kahn & Byosiere, 1992).

Longitudinal studies are needed to arrive at a conclusion about causality. Dormann and Zapf (1999) reviewed 10 longitudinal studies published between 1985 and 1999 that examined the interaction effect of social support. Three of these studies found no moderator effects. In some of the other studies, moderator effects missed the conventional significance level or were only significant for a small part of all the effects tested. Thus, the evidence for an across-the-board moderator effect of social support is not very strong. A closer look at some of the recently published studies suggests that there might be specific mechanisms underlying the stress-buffering potential of social support. For example, in correspondence to the stress matching hypothesis (Cohen & Wills, 1985), Frese (1999) found the strongest effects for social stressors and socially related aspects of psychological dysfunctioning. Dormann and Zapf (1999) found a lagged moderator effect of social support only with an 8-month time lag, but neither for shorter nor for longer time lags. More research is needed that examines in more detail how the effects of social support unfold over time.

Moreover, there is increasing evidence that social support does not have unequivocal positive effects. A number of authors reported that a high degree of social support or related variables increased the relationship between stressors and strain symptoms (Schaubroeck & Fink, 1998). Peeters, Buunk, and Schaufeli (1995) showed that a high level of instrumental social support may induce feelings of inferiority that are detrimental to an individual's well-being.

In addition to social support, group work factors such as group cohesion or team climate play a role when it comes to stress in organizations. First, research suggests that individuals who work in teams experience better well-being than do individuals working in no team or a pseudoteam (Carter & West, 1999). Second, group cohesion and favorable team climates were found to be associated with team members' well-being (Carter & West, 1998; Sonnentag, Brodbeck, Heinbokel, & Stolte, 1994; for an overview, cf. Sonnentag, 1996). Third, work group factors such as psychological safety (Edmondson, 1999) or collective efficacy (Schaubroeck, Lam, & Xie, 2000) might buffer the negative effects of stressors. However, empirical studies are still rare (for a related recent study, cf. Bliese & Britt, 2001). Forth, there is increasing evidence that emotional contagion occurs in work groups (Bakker & Schaufeli, 2000; Totterdell, Kellett, Techmann, & Briner, 1998). Emotional contagion refers to processes by which an individual's mood is transmitted to other persons—for example, other team members. On the one hand, this phenomenon implies that a stressful events can influence more persons than simply those directly faced with the stressor. On the other hand, other team members' positive moods can serve as a resource when another member is confronted with a stressful situation. Linking group work factors to stress issues seems to be a fruitful avenue for future research.

Coping Styles

A favorable coping style can be a core resource for bolstering an individual's health and well-being. Lazarus and Folkman (1994) defined coping as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p. 141). They differentiated between problem-focused and emotion-focused forms of coping. Problem-focused coping includes problem-solving behaviors that aim directly to change the stressor, other aspects of the environment, or one's own behavior. Emotion-focused coping refers to attempts to manage cognitions or emotions directly (for a critique and extension, cf. Semmer, 1996).

Problem-focused coping has been found to be positively related to mental health and well-being, whereas emotion-focused coping and an additional style of avoidance coping were often found to be associated with poorer well-being (Guppy & Weatherston, 1997; Hart, Wearing, & Headey, 1995; Leiter, 1991; Sears, Urizar, & Evans, 2000).

With respect to moderator effects, empirical findings are less conclusive. Many studies did not find the hypothesized moderator effects of coping on the relationship between stressors and strains (e.g., Ingledew, Hardy, & Cooper, 1997). Most studies that found a moderator effect of coping identified problem-solving coping as a favorable coping style, whereas emotion-focused coping turned out to be an unfavorable coping style (Parkes, 1990). This implies that individuals who approach the stressors directly or engage in other problem-solving behaviors are better off than individuals who concentrate on the management of their emotions and cognitions.

Authors like Perrez and Reicherts (1992) have argued that coping behavior should match the situation in order to be effective. A recent study in a hospital setting supports this assumption (de Rijk, Le Blanc, Schaufeli, & de Jonge, 1998). Problem-focused coping was found to be only superior in situations in which nurses could exert control over their work situations. In low-control situations, attempts of problem-focused coping were negatively associated with individuals' well-being.

Locus of Control

Locus of control (Rotter, 1966)—an individual difference concept—refers to whether individuals see themselves as primarily able to control their lives and their major experiences (internal locus of control) or whether individuals think that other people or forces beyond themselves (e.g., luck) determine what happens to them (external locus of control). At the most general level, it is assumed that individuals with an internal locus of control exert more direct action against the stressor than do those with an external locus of control. Therefore, it is expected that they will suffer less from work-related stressors (Cohen & Edwards, 1989). Indeed, individuals with an internal locus of control experience better mental health than do individuals with an external locus of control (for reviews, cf. Glass & McKnight, 1996; Kahn & Byosiere, 1992). Such a positive effect of an internal locus of control was also confirmed in longitudinal studies (Daniels & Guppy, 1994; Newton & Keenan, 1990).

Additionally, it was tested whether a high internal locus of control buffers the negative effects of a stressful work situation. Findings from cross-sectional studies seem to support such a moderator effect (for a review, cf. Kahn & Byosiere, 1992). However, results from longitudinal studies are less conclusive. For example, in the study by Newton and Keenan (1990), only a small portion of the tested moderator effects reached their significance level. Longitudinal studies by Parkes (1991) and Daniels and Guppy (1994) reported more complex three-way interactions between stressors in the work situation, job control, and locus of control.

Taken together, research suggests that locus of control has a main effect on well-being. However, longitudinal studies did not provide evidence for a simple moderator effect of locus of control on the relationship between stressors and strains.

Self-Esteem, Self-Efficacy, and Competence

Self esteem and self-efficacy are important for an individual's health and well-being. There is consistent empirical evidence for a main effect of self esteem and self-efficacy (for reviews, cf. Kahn & Byosiere, 1992; Sonnentag, 2002). Evidence for a moderator effect of self-esteem is weak (Jex & Elacqua, 1999). With respect to self-efficacy, there is more evidence—although not unequivocal—for a moderator effect. Some studies show that the relationship between stressful work situations and poor well-being is stronger for individuals low on self-efficacy than for individuals high on self-efficacy (Jex & Bliese, 1999; VanYperen, 1998). There are additional studies that reported this moderator effect for some but not all of the studied stressor or strain measures (Bhagat & Allie, 1989; Jex & Elacqua, 1999). Jex and Gudanowski (1992) and Saks and Ashforth (2000) did not find an interaction effect for self-efficacy. Parker and Sprigg (1999) provide evidence that proactive personality—a concept closely related to self-efficacy—attenuates the stressor-strain relationship, particularly when job control is high. Also recent work by Schaubroeck and his coworkers suggests a more complex picture with three-way interactions between stressors, job control, and self-efficacy (Schaubroeck, Lam, & Xie, 2000; Schaubroeck & Merritt, 1997).

Because self-efficacy is an individual's belief that he or she is competent, the issue of subjective competence can be discussed within the self-efficacy framework. Surprisingly, we know of no studies on objective competence and skills as resources in the stress process. This is all the more surprising because skills needed at work should be the prime candidates for dealing with stressors.

Other Person Factors

In the past, researchers paid attention to the Type A behavior pattern as one important individual difference variable in explaining negative effects of stressful work situations, particularly with respect to cardiovascular diseases. Type A individuals are competitive, hostile, impatient, and hard driving. Ganster and Schaubroeck (1991) and Kahn and Byosiere (1992) summarized the findings of studies on Type A behavior pattern. There is some support for a main effect of Type A behavior on strain. More specifically, the hostility component was found to be closely related to physiological reactivity (Ganster, Schaubroeck, Sime, & Mayes, 1991). In contrast, the evidence for a moderator effect of Type A behavior pattern is weak (Kahn & Byosiere, 1992). More recent longitudinal studies are inconclusive. Type A behavior enhanced the relationship between stressors and strains in one study (Moyle & Parkes, 1999), whereas it attenuated this relationship in another study (Newton & Keenan, 1990).

Hardiness is another individual difference variable assumed to moderate the stressor-strain relationship. Hardiness comprises the dimensions commitment, control, and challenges

(Kobasa, Maddi, & Kahn, 1982). There is some evidence for a main effect of hardiness on individual health, but support for a moderator effect was found only in some studies (e.g., Howard et al., 1986) but not in others (e.g., Tang & Hammontree, 1992).

Sense of coherence (Antonovsky, 1991) is a concept closely related to hardiness. Its central aspects are perceived comprehensibility, manageability, and meaningfulness of the environment. Recently, researchers included sense of coherence as a potential moderator in studies on work-related stress. Cross-sectional research suggests that sense of coherence can attenuate the negative impact of high-strain jobs (Söderfeldt, Söderfeldt, Ohlson, Theorell, & Jones, 2000). Longitudinal tests are needed to substantiate this effect.

Conclusions About Moderator Effects

Methodological reasons make it difficult to detect moderator effects, particularly in nonexperimental studies. Moderated regression analysis is a conservative procedure that makes it hard to establish moderator effects. Thus, the field of moderators in stress research may very well have to deal with a large Type II error (i.e., not finding in research what exists in reality). First, main effects are entered first into the regression equation, and therefore not much variance remains to be explained by the interaction term. This problem is enhanced in longitudinal studies in which the initial level of the strain measure (i.e., the dependent variable) is also entered into the regression equation as a control variable. Because individual strain measures are fairly stable over time, a large proportion of the variance of the dependent variable is already explained. Thus, there is little variance left to be explained by the interaction effect. Second, most stress studies rely on relatively small sample sizes; this implies that the studies do not have enough power for detect the moderator effects even if they exist (Aiken & West, 1991).

Consequently, empirical findings on moderator effects are mixed. There are some studies—including those using longitudinal designs—that speak for a moderator effect of control, social support, and coping styles. Cross-sectional findings on a moderator effect of self-efficacy are encouraging. However, support for a moderator effect of locus of control, Type A behavior, or hardiness are weak.

If we analyze these findings in the light of methodological problems associated with the test of moderator effects, it seems warranted to continue research in this area. However, we think that the following recommendations may make it more likely to find moderator effects: First, more attention should be paid to a match between specific stressors and specific moderators (cf. Cohen & Wills, 1985). For example, it is plausible to assume that social support, which provides additional information on role requirements, will attenuate the negative impact of role ambiguity but not the negative impact of high time pressure. Second, large sample sizes are needed for ensuring sufficient power for detecting effects. Third, design issues are important as well. Given the power issues involved, one can select workplaces with the extremes of stressors (high vs. low stressors) and resources (e.g., very high vs. very low control) and test for interactions within such a design (Aiken & West, 1991). Fourth, it is necessary to understand better whether the resources have an impact on stressors (and vice versa). One reason may be that, for example, control at work leads to a reduction of certain stressors (particularly those that match the control). If this is the case, then we would know why resources are sometimes negatively related to stressors. One way to deal with the problem of confounding between resources and stressors is to study people who are new in their jobs. Finally, we suggest combining experimental and field studies to a larger extent, attempting to simulate in the experiment the same types of stressors and resources that are studied in the field.

In summary, research on resources has revealed main effects of resources on health an well-being; this implies that the availability of resources is helpful and beneficial in itself and across a wide range of situations. Additionally, there is some—although not unequivocal—evidence that certain resources can attenuate the negative effects of stressors on health and well-being. Particularly important are control at work, social support, coping styles, and self-efficacy.

Stress and Performance

Stress in organizations may influence not only individual health and well-being but may also influence performance. Performance refers to individuals' actions that are relevant for organizational goals (Campbell, McCloy, Oppler, & Sager, 1993). Borman and Motowidlo (1993) differentiated between task and contextual performance. Task performance refers to in-role behaviors that contribute to the organization's technical core. Contextual performance refers to extra-role, discretionary behaviors that do not directly contribute to an organization's technical core but that are assumed to support its broader organizational, social, and psychological environment.

There are several contradictory assumptions about how stressors in organizations affect performance. It is plausible to assume that stressors have a negative linear effect on performance. Such a negative effect can be explained by direct and indirect effects. The direct effect implies that stressors—particularly situational constraints—make task accomplishment more difficult, if not impossible. For example, if a task

has to be accomplished with specific technical equipment and this equipment is not available because of a computer breakdown, task performance will suffer directly. Moreover, stressors may indirectly affect performance—for example, by decreasing alertness or motivation, which in turn negatively affects performance.

There is a long tradition in conducting laboratory studies on the task performance effects of stressors (Postman & Bruner, 1948). These studies show that the exposure to stressors leads to cognitive reactions such as narrowed attention (including a focus on salient cues) and reduced working memory capacity (Baddeley, 1972; Hamilton, 1982; for summaries, cf. Hockey, 1986; Wickens, 1996). A reduced working memory capacity is associated with a speed-accuracy tradeoff when working under stressful conditions—particularly under time pressure (Hockey, 1986; Lulofs, Wennekens, & van Houtem, 1981). Moreover, narrowed attention and reduced working memory capacity have an impact on decision-making strategies. More specifically, they result in simpler decision strategies, recognition rather than analytical strategies, and less complete mental simulations (Klein, 1996). Recent studies suggest that the effects of stressors on performance are mediated by fatigue (Hockey, Maule, Vlough, & Bdzola, 2000; Lorist et al., 2000).

Some of these effects of stressors were also found in more realistic simulations of work environments. For example, simulated workload resulted in a performance decrease in some studies (Glaser, Tatum, Nebeker, Sorenson, & Aiello, 1999; Jimmieson & Terry, 1999) but not in all (Shaw & Weekley, 1985). When using a mail-sorting task, Searle et al. (1999) found that high job demands (i.e., high workload) were associated with an increase in performance attempts but also with a reduction in performance accuracy, particularly in situations with low control.

In contrast to these findings from laboratory and simulation studies, findings from field studies are far less consistent. With respect to task performance, some stressors were found to be related to impaired performance, whereas others were not. For example, in a study on secretaries' job performance, Spector, Dwyer, and Jex (1988) reported a negative relationship between secretaries' perceptions of constraints and ambiguity with supervisory performance ratings. No significant relationships, however, between secretaries' perceptions of workload or conflict and supervisory performance ratings emerged. Similarly, Beehr, Jex, Stacy, and Murray (2000) found negative relationships between specific stressors (i.e., acute stressful events, chronic occupation-specific stressors and workload variability) and an objective financial performance measure of door-to-door book sellers but found a *positive* relationship between role overload and job performance. In a classic study of engineers and scientists, Andrews and Farris (1972) reported that experienced time pressure increased subsequent performance. One of the best studies (Jones et al., 1988) showed that stressors at work increase the likelihood of errors and that an organization-wide stress management program and changes in management of the hospitals reduced malpractice. All these results point to the need to develop a more specific theory of how stressors are related to performance.

Evidence from meta-analyses suggests that there is no substantial relationship between role stressors such as role ambiguity or role conflict and job performance, at least when job performance is assessed by objective measures or supervisory-peer ratings (Jackson & Schuler, 1985; Tubbs & Collins, 2000). Findings from field studies on the performance effects of situational constraints are inconclusive as well. Some studies found performance-deteriorating effects of situational constraints, whereas others did not (for a summary, cf. Jex, 1998).

There are several explanations for the lack of substantial linear relationships between stressors and job performance in field studies. First, one might assume a curvilinear relationship between stressors and performance; this would imply that the performance effects of stressors are not uniform across all degrees of stressor intensity. For example, similarly to the Yerkes-Dodson Law (1908) on the relationship between arousal and performance, performance might increase as stressors increase up to a moderate degree; when stressors become too high, however, performance might decrease. Studies that tested the assumed curvilinear relationship between stressors and performance failed to find such a relationship, however (e.g., Jamal, 1985; Westman & Eden, 1996). Second, the relationship between stressors and job performance might be moderated by other variables. Such moderator variables might include individual competence (Payne, 1991) or work commitment (Jamal, 1985). Until now, however, empirical evidence for the existence of such moderator effects is weak (for a summary, cf. Jex, 1998). Third, the performance measures used in most of the field studies might be too global for showing a performance-deterioration effect of work stressors. For example, a study by Kjellberg, Sköldström, Andersson, and Lindberg (1996) suggests that specific performance measures such as reaction times show decrements under stress in a field setting.

Fourth, possibly there is essentially no—or no large—effect of stressors on performance in field settings. This interpretation would contradict findings from laboratory studies that showed stressors to impair basic cognitive processes. However, impairment of basic cognitive processes may not necessarily translate into a decrease in overall job performance in real-life work settings. Individuals are able to compensate for the effects of stressors—for example, by switching to

different task strategies (Sperandio, 1971). Hockey (2000) offers an additional explanation for the inconsistency between laboratory and field study results: Many laboratory tasks are relatively simple, trivial, and underlearned. If stressors occur in such a situation, study participants have few possibilities to switch to different strategies, be it because of a lack of skills in the specific task, or because of the restrictions of the laboratory setting. Real-life work tasks, however, are usually well-learned and complex. If stressors occur in these real-life situations, individuals often possess the necessary skills to pursue different strategies. Moreover, in organizational settings, goal attainment has high priority; this implies that task performance must be protected, if necessary, at the expense of increased effort or neglect of subsidiary activities. Klein (1996) additionally argues that some of the cognitive strategies affected by stressors in laboratory settings play a minor role in real-life settings. For example, analytical decision strategies suffer from time pressure, but such strategies are rarely used in natural decision making; therefore, the negative impact of performance is limited.

There are a few studies that examined the relationship between stressors and contextual performance. For example, Motowidlo, Packard, and Manning (1986) reported negative relationships between the intensity and frequency of stressful events on the one hand and interpersonal aspects of job performance of nurses on the other hand. Kruse (1995, cited in Jex, 1998) tested whether situational constraints were related to organizational citizenship behavior (OCB) and reported negative relationships between situational constraints and three aspects of OCB. These findings suggest that in stress situations, individuals assign priority to maintain task performance at the expense of discretionary behaviors such as contextual performance. However, a longitudinal study by Fay and Sonnentag (in press) suggests that the experience of stressors at work can even have an enhancing effect on extrarole performance and personal initiative. Similarly, Bunce and West (1994) reported that health care professionals responded with innovations to the experience of stressors at work.

Taken together, laboratory studies showed that stressors impair basic cognitive processes. However, as field studies indicate, this impairment does not necessarily result in a decrease in overall job performance. In particular, workload was found to be associated with higher job performance. These findings suggest that individuals spend more effort, prioritize the most relevant tasks, and use compensatory strategies for upholding their performance under stressful situations. It remains unclear whether and how such a performance management strategy is associated with health or well-being effects. It might be that such an approach exhausts an individual's resources in the long run and therefore affects an individual's health and well-being in a negative way.

Stress and Other Aspects of Organizational Behavior

Organizational stress is related to low organizational commitment, high turnover rates, and—under specific conditions—increased levels of absenteeism. *Organizational commitment* refers to an individual's bond or link to the organization (Mowday, Porter, & Steers, 1982). It comprises attitudinal, normative, and continuance aspects (Allen & Meyer, 1990). In a meta-analysis on organizational commitment, Mathieu and Zajac (1990) reported mean weighted corrected correlations between role stressors (role overload, role conflict, role ambiguity) and various aspects of organizational commitment ranging between $r = -.206$ and $r = -.271$. Thus, individuals perceiving a more stressful work situation reported lower organizational commitment.

There is clear meta-analytic evidence that work-related strains including impaired health are positively related to *absence behavior* (Farrell & Stamm, 1988; Martocchio, Harrison, & Berkson, 2000). However, this does not necessarily imply that stressors at work are related to absenteeism. Stressors may overlap with strain and strain may overlap with absenteeism, but strain may not be the mediator between stressors and absenteeism. A variance decomposition idea explains how such a relationship may appear. There is common variance between stressors and strain and between strain and absenteeism. But the two common variance fields do not overlap. Thus, it is that part of strain that is not related to stressors that may contribute to absenteeism. As a matter of fact, the data on the relationship between stressors and absenteeism are inconclusive. Cross-sectional studies found weak and often nonsignificant relationships between work stressors and absence data (Chen & Spector, 1992; Hemingway & Smith, 1999; Peter & Siegrist, 1997). Some studies revealed positive relationships between stressors and absenteeism (e.g., Kristensen, 1991), whereas others showed negative relationships (e.g., North, Syme, Feeney, Shipley, & Marmot, 1996).

Also longitudinal studies resulted in inconsistent findings. Tang and Hammontree (1992) found that work stress in police officers was a significant predictor of self-reported absence; they also found this to be true when they controlled for prior absence (time lag was 6 months). Vahtera, Kivimäki, Pentti, and Theorell (2000) analyzed absence data from more than 500 Finnish municipal employees over a period of 7 years. They found that initially healthy employees who experienced high psychological job demands in 1990 had a 21% higher risk of long absence spells (more than 3 days) than did employees with low psychological job demands in 1990. For physical demands, the risk of long absence spells

was even 66% higher. The experience of downsizing and perceived job insecurity also increased the risk of absence spells (Kivimäki et al., 1997).

Smulders and Nijhuis (1999) collected data on absence frequency and rate of 1,755 male employees of a Dutch technical maintenance company. In their analyses, Smulders and Nijhuis controlled for employee health and absenteeism in the 1st year of their study. Results showed that high job demands were not associated with higher absence frequency or absence rate during the following 3 years. Contrary to what one might expect, high demands predicted a *lower* absence rate, particularly when the Poisson regression method was used. Similarly, a natural experiment (Parkes, 1982) found lower absence rates in high-demand work settings.

These cross-sectional and longitudinal findings suggest that the relationship between stressful work situations and absenteeism does not follow a simple pattern. First, it might be that the relationship is contingent on moderator variables. In line with the job demand-job control model (Karasek, 1979), one might argue that job control is such a moderator. However, although there is some support for this assumption (e.g., Dwyer & Ganster, 1991), most empirical studies did not confirm the hypothesized interaction effect of job control on the demands-absenteeism relationship (Smulders & Nijhuis, 1999; Vahtera, Pentti, & Uutela, 1996).

Moreover, person factors such as organizational or professional commitment might play a role in the stressor-absenteeism relationship. It might be that in stressful work situations, absenteeism increases in employees with low commitment but decreases in highly committed employees. Data reported by Jamal (1984) partially supported this assumption. Gender might also play a role. For example, Melamed et al. (1995) found substantial correlations between objective monotony and sickness absence in women but not in men.

Additionally, a study by Peter and Siegrist (1997) suggests that it is not the stressfulness of a situation per se that affects an employee's absence behavior. In accordance with the effort-reward-imbalance model, the authors found that status incongruity (i.e. a mismatch between effort and career achievements) was positively related with both short-term and long-term absenteeism in middle managers, whereas effort alone (i.e. time pressure and interruptions) was not related to absenteeism. These findings can be explained in the context of a psychological contract interpretation (Rousseau, 1995): Stressors increase absenteeism if employees feel that their efforts are not rewarded adequately. Longitudinal studies are needed that explicitly test this assumption.

Stressful work situations are positively related to *turnover intentions* and *turnover behavior*. There is rather consistent evidence from numerous studies that stressors in the work situation are positively related to intentions to quit the organization and to job search behavior (Cavanaugh, Boswell, Roehling, & Boudreau, 2000; Chen & Spector, 1992; Gupta & Beehr, 1979). With respect to actual turnover behavior, a recent meta-analysis by Griffeth, Hom, and Gaertner (2000) reported effect sizes ranging from $\rho = .10$ to $\rho = .21$ (corrected for measurement error in the predictors and sampling error) between stressors and turnover behavior.

Taken together, there is empirical support for the assumption that stressors in the work situation are related to low organizational commitment, turnover intentions, and turnover behavior. However, with respect to organizational commitment and turnover intentions, the issue of causality remains unclear. Although it makes intuitive sense to assume that experiencing a stressful work situation increases the intention to quit the organization, individuals who plan to leave the organization might *perceive* more stressors than do their coworkers who in fact experience the same work situation but intend to stay. Longitudinal studies are needed in this area.

In general, research in this area suggests that organizational stress is detrimental not only to individuals' health and well-being; it can also harm the organization by increasing turnover rates and—possibly, although it has not been proven—absenteeism.

STRESS INTERVENTIONS

Stress prevention can be achieved with different sorts of programs (Ivancevich & Matteson, 1988; Murphy, 1988; Murphy, 1996; Theorell, 1993). In the United States, stress interventions are often only directed at the individual in the sense of stress management programs. In Europe, there has been a bit more emphasis on job-oriented stress interventions such as job restructuring (which increases the resources control and skills; Cooper & Payne, 1992). Table 18.4 displays

TABLE 18.4 Stress Interventions in Organizations

	Individual	Organizational
Stressor reduction	Reduction of individual stressor (e.g., time pressure)	Reduction of stressor (e.g. organizational problems)
Resource increase	Competence training	Participation in decision making, health circles
Strain reduction	Relaxation, stress immunization, training, respites (vacations, leisure time)	Rest periods
Lifestyle changes	Antismoking program; exercise program	Nonsmoking buildings; salient staircases vs. salient elevators

organizational and personal approaches to stressors, strains, and resources. Although the differentiation in various approaches is convenient, in many cases multiple approaches are combined—for example, institutional resource enhancement and individual stress-management programs (cf. Kompier, Aust, Van den Berg, & Siegrist, 2000; Kompier, Cooper, & Geurts, 2000).

Stressor Reduction

Stressors can be reduced by individuals or by institutions (or some combination). Examples for the latter are reduction of noise, change of assembly line speed in accordance with the circadian rhythm, reduction of interruptions at work. *Individual stressor reduction* is often an outgrowth of stress management programs that alert people to the fact that they can change certain parts of their work environment. However, individual stressor reduction often presupposes a certain amount of control over work (or in general, a certain amount of resources). Certainly, people have an impact on what the job looks like—including the stressors and the resources (Ilgen & Hollenbeck, 1991). As discussed previously, we do not know of any studies, however, that have examined how resources affect stressors or vice versa. These studies are necessary to understand how people as individuals change stressors.

Institutional stressor reduction approaches may take many different forms. A general stressor reduction approach (or better exposure time reduction) is to decrease the number of working hours, which seems to have positive effects, as reported in some company reports (Kompier, Aust, et al., 2000) and in a meta-analysis (Sparks, Cooper, Fried, & Shirom, 1997). Other institutional approaches reduce specific stressors that are suspected to be problematic. For example, an organization may reduce noise and may ensure a better flow of material, thereby reducing organizational problems—or there may be a reduction of time pressure, task ambiguity, or task difficulty. Such institutional stressor reduction approaches are useful, although problems may arise if such an approach is used singly and not in combination with other approaches: First, reducing stressors may sometimes lead to a reduction of challenges. If there is high qualitative overload, one may be tempted to reduce overload by decreasing the cognitive demands of a job. This can, however, reduce not only overload but also challenges and resources. A case in point was the effort to reduce external disturbances in secretaries by introducing central typing pools. In this case, interruptions and disturbances—stressors about which secretaries frequently complain—were reduced, but this also reduced control over how and when to do a job and reduced a clear and reliable relationship between a secretary and his or her boss. Second, because technological and organizational changes are quite frequent and increasingly rapid, research is too slow to tell us which stressors are particularly problematic and need to be taken care of. Therefore, reduction of stressors should be accompanied by an increase in resources.

Increase in Resources

Two important resources at work are control at work and competencies or skills. Resources in the sense of control or participation in decision making help individuals to have an influence on how to do their work and to increase or reduce stressors appropriately. Stressors that come about through new technology can best be addressed when resources are given to influence one's work. Thus, restructuring work by increasing job content and responsibilities often has a stress-preventive function as well. At least two careful studies on the effects of *institutionally increasing* control have been done (Jackson, 1983; Wall & Clegg, 1981). Jackson (1983) used a four-group Solomon control group design to study the effects of enhanced participation (increase of group meetings) in decision making that she hypothesized to increase power, information, and social support. An increase of participation in decision making decreased emotional stress, absence frequency, and turnover intention. Wall and Clegg (1981) showed that increase in autonomy and control by introducing semiautonomous work groups led to short- and long-term (12 months after the study was ended) increases in mental health. Unfortunately, this effect could not be replicated in another study (Wall, Kemp, Jackson, & Clegg, 1986).

Increasing *individual competence and skills* is also an aspect of resources, although it has not been typically discussed as a stress prevention technique. Without the necessary skills it is not possible to use control (Frese, 1989). Three arguments speak for the importance of competence as a resource in the stress process. First, working smarter, not harder is a good description of what superworkers—that is, excellent performers—do (Frese & Zapf, 1994; Sonnentag, 2000); because working smart implies using efficient rather than inefficient action strategies, this means that employees experience less stress when working smart. Second, it follows from the P-E fit model (cf. our discussion of this model earlier in this chapter) that people can increase the fit by developing their competence to deal with environmental demands. When a person is supposed to produce a certain number of products, development of skills helps him or her to actually do that—the P-E fit will be high and strain low. Third, self-efficacy is intimately related to competence. Bandura (1997) has argued for the strain-reducing function of self-efficacy in

various domains and has shown that self-efficacy (e.g., via mastery experiences that increase the competence to deal with difficult situations) plays an important role in the strain reduction process.

An additional resource is social support (mainly by supervisors; Frese, 1999), which may be increased by management training. However, to our knowledge, the strain-reducing nature of management training has not been shown yet.

Combination of Stressor Reduction and Increase in Resources

In general, Elkin and Rosch (1990) suggested that the following interventions can be used to decrease stress: task and work environment redesign, flexible work schedules, participation in management, analysis of work roles, establishment of goals, social support, cohesive teams, fair employment policies, and shared rewards. More specifically, Bunce and West (1996) showed that an approach encouraging people to innovatively deal with work stressors led to a reduction of strain (this finding was also replicated by Bond & Bunce, 2000). Bunce and West's concept increased the subjective resources to deal with stressors because it encouraged innovative approaches. It is similar to the German concept of health circles (quality circles applied to health issues) that discuss stressors and work problems that can potentially lead to ill health (Beermann, Kuhn, & Kompier, 1999; Slesina, 1994). A program on reduction of burnout with a similar element of suggesting innovative approaches to deal with the stressors has also been suggested by Van Dierendonck, Schaufeli, and Buunk (1998). They combined their approach to changing the workplace with enhancing the individual's realistic orientation toward investments and outcomes so that the impression of equity was increased. Van Dierendonck et al. (1998) found their training to reduce emotional exhaustion, although it did not positively affect depersonalization and personal accomplishment.

Strain Reduction

Individually oriented strain reduction programs belong to the most frequently used programs in business; as a matter of fact, in some reviews, individual strain reduction programs are the only ones discussed in presentations of evidence on stress management. A large body of studies exists, and reviews find clear and positive effects. Stress management programs attempt to influence employees to interpret a situation not as stressful but as a challenge. They also teach a person to improve one's coping strategies and to reduce strain (stress immunization or relaxation techniques). Because there are excellent reviews (e.g., Bamberg & Busch, 1996; Murphy, 1996; Van der Klink, Blonk, Schene, & Van Dijk, 2001), we do not need to discuss studies on stress management in detail.

Two techniques stand in the foreground (Murphy, 1996): relaxation techniques and cognitive-behavioral techniques (cf. also Bellarosa & Chen, 1997). Relaxation is most often based on progressive muscle relaxation (Jacobson, 1938) as well as meditation and biofeedback. By and large, progressive muscle relaxation has been shown to be effective (e.g., Murphy, 1996). It is particularly effective for psychophysiological outcomes; for other outcomes, the effect size for cognitive-behavioral techniques is higher (Van der Klink et al., 2001).

Cognitive-behavioral techniques are based on cognitive therapy for depression (Beck, 1967; Whisman, 1998), on rational-emotive therapy (Ellis, 1962), and on stress immunization or stress inoculation (Meichenbaum, 1985). Cognitive therapy has been shown to be a highly useful procedure for depressive individuals in clinical trials (Robinson, Berman, & Neimeyer, 1990) and in stress management for working populations (Bamberg & Busch, 1996; Murphy, 1996; Van der Klink et al., 2001). Most studies do not really differentiate in detail between cognitive and rational-emotive therapy, and a combination is usually preferred. Similar positive effects appear for rational-emotive therapy. Rational-emotive therapy works by helping the person to use rational self-instructions. For example, a person might have a tendency to exaggerate a given stress situation and catastrophize when something goes wrong. Alternative self-instructions are then trained (for example, it is not catastrophic if something goes wrong because mistakes happen to most people). Stress inoculation training is "designed to impart skills to enhance resistance to stress" and its objective is "to prepare the individual to respond more favorably to negative stress events" (Saunders, Driskell, Johnston, & Salas, 1996, p. 171). Stress inoculation works via three phases: First, conceptualization and education; second, skill acquisition and rehearsal; and third, application and follow-through (Saunders et al., 1996). The first phase—conceptualization and education—teaches people to have a more sophisticated view of the nature of stress. Second—acquisition and rehearsal—provides a stronger repertoire of coping skills and rehearses them either in vivo (e.g., role-play) or in guided imagery. Third—application and follow-through—works also via role play and guided imagery to deal with the real-life threats and stressors. A meta-analysis of 37 studies showed that performance anxiety was strongly affected ($r = .509$), state anxiety was also affected ($r = .373$),

and—finally—there was also a positive performance effect ($r = .296$; Saunders et al., 1996).

One meta-analysis of 16 work-related stress management studies found an average effect size of 0.41 (Bamberg & Busch, 1996). A second, more recent meta-analysis (Van der Klink et al., 2001) found somewhat different effect sizes for 18 cognitive-behavioral studies ($d = .68$), 17 relaxation studies ($d = .35$), and 8 so-called multimodel approaches (acquisition of passive and active coping skills; $d = .51$). Thus, stress management programs increase health by about a half of a standard deviation. The study by Murphy (1996) corroborates these results by showing that published reports on 64 stress management interventions show on average between 59% (for job and organizational outcome measures) and 68% (for physiological and biochemical outcome variables) positive and significant results. Furthermore, those interventions that used a combination of approaches (e.g., relaxation and cognitive-behavioral techniques) tended to lead to the best results. Murphy (1996) and Van der Klink et al. (2001) also reported results for more disturbed individuals and for remedial interventions to be better than results for normal employees or preventive approaches; this implies that clinical studies show better results than does stress management training for unselected working populations. An additional constraint of most stress management programs is that they presuppose that the employees can actually do something about their stress levels (i.e., have at least some measure of control at work). Employees with a high degree of control at work and with higher status jobs showed better success in stress management interventions than did low-control or low-status job employees (Van der Klink et al., 2001). For this reason, stress management programs are probably less useful for blue-collar workers than for white-collar workers and managers.

Thus, in general, a positive picture on stress management programs appears. However, a number of caveats are in order: First, it is quite plausible that negative or zero effects do not find their way into the journals (Murphy, 1996). Second, the better studies with randomized control groups showed a lower degree of success than did the studies without a control group (Murphy, 1996). Finally, reviews find clear nonspecific effects; this points to the importance of using control groups in stress intervention studies. For these reasons, a certain degree of skepticism has to prevail. On the positive side, stress management programs are often effective in increasing life expectancy—for example, if given to heart disease patients (34% reduction in cardiac mortality; Dusseldorp, Van Elderen, Maes, Meulman, & Kraaij, 1999).

Digressing somewhat from the general theme of strain reduction, it is useful to look at Van der Klink et al.'s (2001) comparison of individual stress management approaches to organizational changes with the aim to reduce stress and increase resources. Organizational changes had a nonsignificant effect size that was significantly lower than was the effect size for individually oriented approaches. Unfortunately, they could only include five samples from four organizational intervention studies; these studies showed widely differing effect sizes, from a negative effect size of $-.20$ (Landsbergis & Vivona-Vaughan, 1995) to a positive effect size of .50 (Jones et al., 1988). Moreover, one study had 1,375 participants (Heaney, Price, & Rafferty, 1995), whereas the other studies included only very small groups of participants. Thus, the field of organizational intervention does not provide sufficient data yet to make a meta-analysis feasible. Moreover, it is necessary to study moderators of the effect; for example, Landsbergis and Vivona-Vaughan (1995) explained their negative effects with lack of management commitment to stress management and with obstacles in the implementation of the intervention strategies.

An institutional approach to reducing strain is to provide rest periods. Whereas stress management is a modern topic and full of new research, the study of rest periods is an older topic, with only a few studies appearing each year (Graf, Rutenfranz, & Ulich, 1970). It is well-known that the recovery is fastest after short periods of work and that the first few minutes of a rest period are most important for recovery. Graf et al. (1970) suggests, therefore, that 5% of the work time should be taken as rest periods. Because rest periods are anticipated, performance is higher if there are rest periods (Graf et al., 1970). Therefore, there is usually no decrement in overall performance in spite of the time needed for rest periods (Galinsky, Swanson, Sauter, Hurrell, & Schleifer, 2000; Graf et al., 1970). At the same time, stress effects are smaller when rest periods are interspersed in work (Galinsky et al., 2000). Evidence in the literature suggests that rest periods should be organizationally prescribed and supervised but should not be self-taken (concealed breaks) because people tend to take less frequent and too short rest periods when left to their own decisions (Graf et al., 1970; Henning, Sauter, Salvendy, & Krieg, 1989). Employees also want to cluster rest periods and add them at the end or at the beginning of the workday rather than interspersing them into their workday at regular intervals. We think that the issue of rest periods should be taken more seriously again in the literature on stress interventions than it is at the moment.

Additionally, to strain reduction programs individuals may *initiate strain reduction by themselves* during vacation and other leisure time periods (for a recent review on respites from work, cf. Eden, 2001). Research has shown that during

vacations, burnout decreases—particularly when an individual is satisfied with his or her vacations (Westman & Eden, 1997). Researchers even reported that military reserve service results in a decline in burnout and that psychological detachment from work increased this effect (Etzion, Eden, & Lapidot, 1998). Similarly, leisure time activities pursued during evenings of normal workdays can reduce strain. For example, a diary study revealed that specific activities such as low-effort activities, physical activities, and social activities had a positive impact on a person's well-being, whereas work-related activities performed during leisure time had a negative impact (Sonnentag, 2001). These studies suggest that psychological detachment from work during vacation or leisure time periods is crucial for strain reduction to occur.

Lifestyle Changes

Individually oriented lifestyle change programs attempt to improve diet, to support healthy living (e.g., reducing alcohol and tobacco consumption), and to increase physical exercise. Employee assistance programs (EAP) are a case in point: They often target alcoholism or other addictions, but they can also be broad-based and include exercise and stress management programs; they experienced a tremendous growth in companies during the 1970s and 1980s (Matteson & Ivancevich, 1987). Breslow and Enstrom (1980) have shown that men who used seven positive habits (sleeping 7–8 hours, eating breakfast almost every day, never or rarely eating between meals, being near height-adjusted weight, never smoking, moderate or no use of alcohol, and regular physical activity) had a lower mortality rate across 10 years than did those who followed zero to three practices. Exercise- and health-promoting programs at work have been quite successful in decreasing anxiety (Long & Van Stavel, 1995), in reducing cardiovascular mortality after myocardial infarction (O'Connor et al., 1989), and in enhancing general well-being (Ivancevich & Matteson, 1988). A dramatic example of the success of a wellness program for cardiovascular fitness is the one used by the New York Telephone Company that saved the organization $2.7 million in reduced absenteeism and treatments costs in 1 year alone (Cartwright, Cooper, & Murphy, 1995). More specific psychological programs— for example, toward the coronary-prone Type A behavior pattern—also proved to be effective in reducing coronary recurrences (Nunes & Kornfeld, 1987).

Surprisingly, *institutional approaches* such as building architecture have not been studied to our knowledge as potential stress interventions. Office buildings may make it easier or harder to use the stairs, for example, by making either the staircase or the lift salient. It is surprising that a relatively small amount of daily physical activities, such as walking stairs, walking to work, doing small errands on foot, or bicycling to work have an enormously positive effect on mortality ratios. An example is the study by Pfaffenberger, Hyde, Wing, and Hsieh (1986) who showed that people using up 500 to 2,000 kcal per week had a reduced mortality rate within the 16 years of study in comparison to men who did not do any physical exercises. The reduced mortality rate was even more pronounced for those using 2,000 kcal per week. Burning 2,000 kcal per week is equivalent to walking, for example, 35 km per week or climbing three flights of stairs 70 times per week; this speaks for the importance of encouraging light sports in the office building by building adequate, aesthetically pleasing, and salient staircases and by encouraging employees to use the stairs.

Conclusion on Stress Interventions

Taken together, the literature on stress intervention concepts and studies suggests a number of conclusions. First, stress intervention studies go under very different names and are presented in very different disciplines and journals. Stress management studies are done by clinicians or clinical work psychologists and are mainly published in the *Journal of Occupational Health Psychology* or the *International Journal of Stress Management.* Lifestyle changes are reported in sports psychology and in medical journals. Rest period studies appear in human factors journals, mainly ergonomics and new technology journals. Stressor reduction and resource enhancement is done by job enrichment and job design professionals and appear in *Academy of Management Journal, Human Relations,* and other outlets. Social resource enhancement—for example, social support increase—is really part of teaching management skills and appear, for example, in *Leadership Quarterly.* Obviously many articles also appear in the more general journals, such as *Journal of Applied Psychology, Journal of Organizational Behavior,* and *Applied Psychology: An International Review;* we think that it pays to pull these diverse areas together and gain by using theories across different intervention domains. The best developed areas of stress interventions are rest periods (although the literature in this area is quite old), stress management techniques, and lifestyle changes. These areas are easier to study because they can be studied experimentally (particularly rest periods) and only imply changes of individuals. Organizational approaches have been studied much less frequently because they are more difficult to study; there is a need to look at moderators (e.g., how well the program is supported by management and how well it is implemented), and these studies are much more risky

because many aspects cannot be controlled by the change agent.

Second, nearly every review of the field speaks about the importance of doing more studies in the area of organizational changes. We can only repeat this call. Most authors assume that it makes sense to combine structural and institutional changes with individually oriented approaches, at least for blue-collar workers (e.g., Bamberg & Busch, 1996; Ivancevich, Matteson, Freedman, & Phillips, 1990; Kompier, Cooper, et al., 2000; Murphy, 1996).

Third, practically every review on stress intervention techniques has called for better designed studies in this area. Because there seems to be a relationship between effect size and study design (Murphy, 1996), this issue needs to be taken seriously. Undoubtedly, better research has been done within the last 15–20 years—particularly in the area of stress management and lifestyle changes.

Forth, one issue of improving design is related to the fact that there are nonspecific effects of stress management. A notreatment control group does not actually account for nonspecific effects; it is therefore necessary to include pseudotreatment control into designs because merely thinking about stress at work and self-reflecting may actually enhance health outcomes as well.

Fifth, most studies only look at short-term changes, but we need to be able to produce long-term changes with stress interventions. Both in the areas of job interventions and in stress management, there are hypotheses in the literature that the effects are mainly short term.

Sixth, by and large, more process-oriented research on stress interventions needs to be done (Bunce, 1997). This can be done by developing manuals as well as by checking how much trainers conform to the theoretically proposed procedures, how much of the effect was due to the specific program, and how much of the effect was due to general effects. Good examples for such an approach exist in the clinical psychology—particularly cognitive therapy—approaches to depression (e.g., Castonguay, Hayes, Goldfried, & DeRubeis, 1995; DeRubeis et al., 1990; Hollon, DeRubeis, & Evans, 1987).

Seventh, research on respites from work stress is a promising area of research (Eden, 2001). More studies are needed that examine the specific features—predictors as well as short- and long-term consequences—of successful respite periods.

Eighth, some authors have confronted emotion-focused versus problem-focused approaches of stress interventions (e.g., Bond & Bunce, 2000). We agree with Keinan and Friedland (1996; p. 269) that a simple comparison cannot be made and leads to inconclusive results and that the following issues need to be considered: (a) Emotion-focused strategies may be better in situations that allow little control and other resources; (b) the long-term effectiveness of emotion-focused strategies may be lower than that for problem-focused approaches; (c) a combination of emotion- and problem-focused strategies is probably superior to either one of them alone.

Finally, more research is needed that pits different approaches against each other. One of the most important issues is whether there are general and specific effects of an intervention (Bunce, 1997; Murphy, 1996). Trainer characteristics also need to be studied more frequently. For example, one study surprisingly showed that less well-trained trainers were more effective in stress management than were experienced trainers (Saunders et al., 1996). Another surprising finding of the meta-analysis by Van der Klink et al. (2001) that needs to be studied in more detail is that there is an inverse relationship between number of sessions and effect size.

OVERALL CONCLUSIONS

Empirical research summarized in this chapter shows that organizational stress has detrimental effects on individual health and well-being. Moreover, stress interventions—particularly those aimed at individual stress management—have been found to have beneficial effects.

Researchers have criticized past empirical studies on organizational stress for their methodological shortcomings (Frese & Zapf, 1988; Kasl, 1978; Sullivan & Bhagat, 1992). During the past decade, an increasing number of studies followed a more rigorous research methodology (e.g., objective measures of stressors, longitudinal designs, test of curvilinear effects). We are convinced that this improved methodology has contributed to substantial progress within organizational stress research. Specifically, we observed progress with respect to the following issues:

First, objective stressors—and not just the perception of stressors—are related to indicators of poor health and well-being. This implies that the well-documented empirical relationship between stressors and strains can not be fully explained by common method variance and overlap in content between independent and dependent variables.

Second, stressors have a causal effect on health and well-being with concurrent effects that are stronger than lagged effects. There are *additional* reverse effects of strains on stressors. However, these effects seem to be relatively weak.

Third, resources are important for an individual's health and well-being. The main effects of resources such as control at work, social support, and self-efficacy are stronger than their buffer effects.

Fourth, there are curvilinear effects of stressors on strains. However, it seems that compared to the linear effects, these curvilinear effects are of minor importance.

Fifth, better designed studies with objective measures report smaller correlations than do studies with subjective measures (cf. also Zapf, Dormann, et al., 1996); it may appear that this points to actually low impact rates of stressors on strain and that the effect of stressors at work is rather small. We think that this would be a mistake (Frese & Zapf, 1988) because (a) no study ever measures all stressors at work; (b) objective measures of stressors underestimate the relationship between stressors and strains because observers' errors decrease the correlations; (c) strain is caused by many factors (stressors at work, biological and psychological predispositions, stressors outside work, etc.)—every one of which can only have a certain amount of influence; (d) there is a selection effect of most studies on stress at work (healthy workers effect) because ill people have a lower probability to be in the sample; (e) there are moderators that may increase the relationships; (f) finally, low correlations often appear to be of less practical importance than is actually the case, as shown by Abelson (1985), Frese (1985), and Rosenthal and Rubin (1982).

Sixth, there are some studies that use natural experiments in stress research (e.g., Parkes, 1982). Kasl (1978) has called for more studies making use of natural experiments, and we can only repeat the suggestion here again.

As a whole, the recent advancements made in organizational stress research demonstrate that it pays to invest in a better research methodology. However, to make real progress in a field it is not sufficient to focus only on research methodology. It is necessary to also invest in theory development and to make sure to address the most relevant research questions (Brief & George, 1995). For deepening the understanding of the process of how and when organizational stress affects the individual and the larger organization, we suggest the following avenues for future research:

First, there is a clear need for a direct comparison between competing theoretical models. Such comparisons are still very rare (for an exception, cf. de Jonge et al., 2000). Such comparisons will be helpful for advancing theory about organizational stress because they will show which specific assumptions within one model make it superior to a competing model.

Second, researcher should pay more attention to the impact of specific stressors and specific resources on specific strains. Such a specificity hypothesis (Broadbent, 1985) implies that specific stressors are related to specific symptoms but not to others. Empirical tests of this hypothesis are still rare (Hesketh & Shouksmith, 1986; Steen, Firth, & Bond, 1998). For a resource to be effective as a stress buffer, it is crucial that the resource matches the specific requirements of the stressor (Cohen & Wills, 1985). Here, researchers have to specify more explicitly which resources are most helpful in a specific stressful situation.

Third, aspects of time should be taken much more seriously within organizational stress research. When studying the effects of stressors longitudinally, researchers should pay more attention to the time lags between the first and subsequent measurement points. Until now it seems that the time lags have been chosen rather arbitrarily or for convenience reasons. As the Dormann and Zapf (1999) study illustrated, some effects are found only for a limited set of time lags. Researchers need to spell out more clearly within which time frame they expect specific strain symptoms to develop. Frese and Zapf (1988) have differentiated the following models based on time and stress exposure effects: (a) stress reaction model that implies an ill-health reaction to the stressor, which is reduced when the stressor is reduced; (b) accumulation model, in which the effect is not reduced even if the stressor no longer present; (c) dynamic accumulation model, in which the effects increase ill health further even when individuals are no longer exposed to the stressors; (d) adjustment model, in which people learn to cope with the stressor and ill health is reduced even though the people are still exposed to the stressors; (e) sleeper effect model, in which the ill health appears after the stressor disappears, as in the case of posttraumatic stress disorder. We think that it is useful to explicitly test different models, taking into consideration exposure time and differential timing effects (cf. also Garst et al., 2000).

Fourth, more attention to time aspects is also necessary for testing interaction effects. It is necessary to examine in more detail at which point in time in the stress process resources are most helpful. For example, resources might act as powerful stress buffers only early in the stress process.

Fifth, researchers should explicitly address the mediating processes in the stressor-strain relationship; this refers both to mediators at the physiological level and to mediators at the emotional and cognitive level (i.e., appraisals).

Sixth, there should be more studies on stress and performance. Laboratory studies suggest that stressors have a negative effect on basic cognitive processes. However, in field study settings, the effects of stressors on job performance are less obvious. It seems that individuals uphold their performance by increasing effort. This increased work effort might have detrimental long-term effects on health and well-being, however. It is interesting to note that there are only a few field studies that simultaneously examined the effects of stressors on performance and on health and well-being. Research on the health effects of organizational stress and research on the performance effects of organizational stress are separate research areas, particularly in field studies. By focusing exclusively on

health and well-being or on performance effects, researchers get to know only one side of the coin. We suggest further advancing organizational stress research by looking simultaneously at the impact of stressors on performance *and* on health and well-being. Such studies could identify the health and well-being costs of upholding high performance in stressful situations. Moreover, such studies could shed light on the performance requirements under which strain symptoms occur. It is also useful to address the role of resources by examining which resources let people uphold performance without impairing health and well-being.

Taken together, organizational stress research has benefited from methodologically more sophisticated studies. It has become obvious that organizational stress affects individual health and well-being in a negative way. Individuals, however, have a broad range of ways of dealing with stress so that both their health and performance do not suffer necessarily. Despite this research progress, there remain many questions to be answered by future research.

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