

Effort–reward imbalance and health in a globalized economy

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Theoretical models are needed to identify the adverse health aspects of stressful psychosocial work environments. One such model, the effort–reward imbalance model, has been widely analyzed in different occupations and different countries. This contribution briefly reviews the theoretical bases of this model, its measurement, and the available evidence on adverse health effects derived from prospective epidemiologic studies. Against this background, new conceptual and methodological challenges are discussed that result from economic globalization, in particular a globalized labor market. It is concluded that meeting these challenges will improve the usefulness of the model in predicting health and in strengthening work-related interventions globally.

Key terms globalized labor market; methodology; prospective evidence; review; work stress.

As health-adverse and psychosocial work conditions cannot be identified by direct physical or chemical measurements, theoretical concepts are needed to delineate particular stressful features of work so that they can be identified at a level of generalization that allows for their use in a wide range of different occupations. A theory is commonly defined as a set of interrelated explanatory statements. Explanatory statements connect two or more single observations in a causal way by referring them to a general rule or principle. Such general principles are rarely available in the social and behavioral sciences, given the substantial variations in time and space of the psychosocial phenomena under study. Therefore, so-called “middle-range theories” prevail in this field of inquiry, in which the range of conclusions is restricted with respect to time and place.

The design of a theory is at first a risky choice because its predictions have to deviate from expectations that are based on already existing knowledge. There is considerable probability that these predictions may fail as they can be contradicted by empirical observations. Thus a successful theory is characterized by a set of far-reaching new predictions that are recurrently supported by empirical observations (1).

Risky predictions are often based on a selective reduction of the complexities of the real world. For instance, in an attempt to explain associations between distinct psychosocial work characteristics and the health of employees, a theoretical model may place its focus on

specific task characteristics, such as the demand–control model (2), or on specific characteristics of the work contract, such as the effort–reward imbalance model (3). There is always a trade-off between the limitations of a conceptual focus that is inherent in a theoretical model and the desire to understand the complexities of reality. Therefore, different “middle-range theories” do not exclude each other, but may be successfully combined to further advance our knowledge.

Theories of work-related stress and health are important not only because they provide new explanations of phenomena that have been poorly understood so far, but also because they are instrumental in identifying targets of intervention and in guiding the development of intervention measures.

A specific challenge of theories of stressful work and health consists of bridging the two phenomena—work and health—through underlying mediating processes. These processes can be conceptualized in terms of adverse health behavior. For instance, people who are exposed to psychosocial stressors at work may smoke more, eat less healthy food, reduce their physical exercise, and the like (4). Alternatively, these processes are defined at the level of psychobiological reactions of the working person’s organism. Psychobiological processes are the pathways through which psychosocial stressors stimulate biological systems via activation of autonomic, neuroendocrine, immune and inflammatory responses by the central nervous system (5). These pathways have a

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range of effects on different bodily systems in which impaired function and structural changes ultimately trigger bodily diseases (eg, cardiovascular diseases) (6).

In the demand–control model of work stress, the psychobiological pathways are analyzed with special focus on the notion of threatened control (2). Job task profiles defined by high psychological demands in combination with low decision latitude and low skill discretion threaten a person’s sense of control and mastery and thus evoke recurrent stress reactions, mainly through activating the hypothalamic–pituitary–adrenocortical and the sympatho-adrenomedullary stress axes (7, 8).

In the effort–reward imbalance model, psychobiological pathways are analyzed with special focus on the notion of threatened reward. Job conditions characterized by an imbalance between high efforts and low rewards in turn elicit states of social reward frustration. Stimulated by a particular brain system, the mesolimbic dopamine system, these states trigger several stress axes within the organism, including the ones mentioned (9, 10).

Description of the effort–reward imbalance model

The effort–reward imbalance model builds on the notion of social reciprocity, a universal social norm of cooperative exchange. Social reciprocity lies at the core of the employment (or work) contract, which defines distinct obligations or tasks to be performed in exchange for adequate rewards. These rewards include money, esteem, and career opportunities, including job security. Contractual reciprocity operates through norms of return expectancy, for which efforts spent by employees are reciprocated by equitable rewards from employers. The effort–reward imbalance model claims that a lack of reciprocity occurs frequently under specific conditions and that failed reciprocity in terms of high cost and low gain elicits strong negative emotions with special propensity towards sustained autonomic and neuroendocrine activation and their adverse long-term consequences for health. According to the theory, contractual nonreciprocity is expected if one or several of the following conditions are given: dependency, strategic choice, or overcommitment (3, 11).

“Dependency” reflects the structural constraints observed in certain types of employment contracts, especially so for unskilled or semi-skilled workers, elderly employees, employees with restricted mobility or limited work ability, and workers with short-term contracts. In all these instances, incentives of paying nonequitable rewards are high for employers, while the risks of rejecting an unfair contractual transaction by employees are low because they have no alternative choice. Dependency is relatively frequent in modern economies characterized

by a globalized labor market, mergers and organizational downsizing, rapid technological change, and a high level of job instability.

“Strategic choice” is a second condition of nonreciprocal exchange. People accept high cost–low gain conditions of their employment for a certain time, often without being forced to do so, because they tend to improve their chances of career promotion and related rewards at a later stage. This pattern is frequently observed in early stages of professional careers and in jobs that are characterized by heavy competition. As anticipatory investments are made on the basis of insecure return expectancy, the risk of failed success after long-lasting efforts is considerable.

Third, there are psychological reasons for a recurrent mismatch between efforts and rewards at work. People characterized by a motivational pattern of excessive work-related “overcommitment” may strive towards continuously high achievement because of their underlying need for approval and esteem at work. Although these excessive efforts are often not met by adequate rewards, overcommitted people tend to maintain their level of involvement. There is reason to believe that this motivational style affects how demands are appraised. Perceptual distortion prevents overcommitted people from accurately assessing cost–gain relations. As a consequence, they underestimate the demands and overestimate their own coping resources while not being aware of their own contribution to nonreciprocal exchange. In the long run, overcommitted people are susceptible to exhaustion and adaptive breakdown.

Although work-related overcommitment defines an intrinsic source of effort, this component of the model is not conceptualized as a traditional personality trait. Rather, this pattern of coping with demands is often elicited and reinforced by external work pressure, whether informal or formal, and may thus act as an amplifier of the work stress–health association. In summary, the model for effort–reward imbalance at work maintains that people experiencing dependency, strategic choice, and overcommitment, either separately or in combination, are often exposed to failed contractual reciprocity at work and its adverse health consequences. In stress-theoretical terms, this model is focused on the afflictions of self-esteem that result from failed social reciprocity (ie, the frustration of rewards following appropriate efforts). Although failed reciprocity mainly results from extrinsic sources, a person’s overcommitted behavior can contribute to it as well. Thus the model combines organizational features with personal coping characteristics.

Measurement of the effort–reward imbalance model

How is the effort–reward imbalance model measured? Although some of the components can be assessed on the

basis of organizational data (eg, career mobility, level of salary, job redundancy), the model is mainly measured by a standardized self-report questionnaire containing 23 Likert-scaled items. The questionnaire is composed of the following three scales: effort (six items); reward (11 items that represent the three dimensions of financial and career-related rewards, esteem and job security in respective subscales), and overcommitment (6 items representing the personal or intrinsic model component) (12). There are three reasons why self-reported data are collected, first, because descriptive and evaluative information is obtained on efforts and rewards, second, because some unobservable distant aspects are assessed (eg, job insecurity, future promotion prospects), and, third, because a pattern of personal coping with demands (overcommitment) is measured.

The psychometric properties of these scales have been tested in many studies, specifically scale reliability, discriminant and predictive validity, and the dimensional structure and factorial stability over time (12–14). Psychometric analyses have been conducted with translated versions of the questionnaire, among others in Dutch, French, Spanish, Hungarian, Japanese, Chinese, and Korean (<http://www.uni-duesseldorf.de/MedicalSociology>).

Several approaches have been used to combine the information obtained from the three scales, in addition to analyzing their main effects on health outcomes. Most often, a predefined algorithm of the two scales “effort” and “reward” is used to give an approximate estimate of the core theoretical notion, the extent of imbalance between cost and gain. To this end, a ratio is constructed with the effort score in the nominator and the reward score (reversed and balanced by a correction factor) in the denominator. Thus the higher the ratio, the higher the imbalance. This information can be used as continuous data (eg, log transformed) or divided into discrete data (eg, quartiles) or dichotomized at a threshold (eg, >1.0). The advantages and disadvantages of the different statistical approaches and suggestions for further improvements cannot be discussed in this presentation (13, 15, 16, and <http://www.uni-duesseldorf.de/MedicalSociology>).

It should be kept in mind that this questionnaire was designed to test its predictive validity in terms of disease outcomes in large prospective cohort studies. Thus it made sense to aim for the most economic, easily applicable standardized questionnaire. In the next section, a brief overview of the main results of this task is given.

Evidence from prospective epidemiologic studies

The prospective epidemiologic observational study is considered a gold standard approach in this field because of its temporal sequence (exposure assessment precedes

disease onset), its sample size (based on statistical power calculation and allowing for adjustment for confounding variables in multivariate analyses), and the quantification of subsequent disease risk following exposure (odds ratio for disease in exposed versus unexposed persons). Therefore, a short summary of the main findings based on prospective studies is given. [For reviews see, the papers by Marmot et al (17), Tsutsumi & Kawakami (18), Van Vegchel et al (19), Kivimäki et al (20), and Siegrist (21).]

Most prospective investigations have studied work stress in relation to cardiovascular diseases and affective disorders (depression). This choice is well justified in view of their contribution to the overall burden of disease (22). At present, eight reports derived from prospective studies of associations between effort–reward imbalance at work and cardiovascular disease or depressive disorders are available. Although the measures were not fully comparable across these studies, most findings support either the full theoretical model or its main components. Odds ratios or hazard ratios vary across the studies, but, overall, the probability of developing cardiovascular disease or a depressive disorder following high effort in combination with low reward at work is increased by 50% to 150%. The findings are more consistent for men than for women, and more consistent for middle-aged persons as compared with early old age populations. In several studies, effects are more pronounced in groups with a lower occupational status (23–29).

Additional health outcomes of prospective investigations testing the model include poor self-rated health, limited physical and mental functioning, alcohol dependence, diabetes, and sickness absence, although the prospective evidence is less robust in these latter cases. Yet all published reports support the core theoretical notion that stressful work in terms of effort–reward imbalance increases the risk of disease and ill health, independent of other main risk factors that might confound the effect (24, 30–34). These results are further supported by the results of a large number of cross-sectional studies that are not reported in this presentation. [For reviews, see Tsutsumi & Kawakami (18) and Van Vegchel et al (19).] In addition, findings from naturalistic or experimental studies add to the robustness of the work stress–health association, as they monitor the psychobiological reactions to this exposure in more detail (35–38).

In summary, the effort–reward imbalance model has been successfully tested in a variety of studies in different countries and different occupations using different health outcomes and applying different research designs. The model is nevertheless confronted with new challenges, most importantly the challenge of far-reaching changes in the nature of work and the challenge of economic globalization, in particular an international expansion of capital, trade, and labor-force

markets. Some of these challenges are discussed in the next section.

Future challenges

Changes in work and employment

With recent progress in information technology and automatization, the traditional separation of the spheres of work and home is vanishing. Homework, telework, participation in virtual networks, and an unprecedented degree of flexibility in local and temporal work arrangements contribute to this process. Within organizations, flexible teams, rather than fixed stable hierarchies, are expanding, and traditional continuous occupational careers are increasingly being replaced by job change, requalification, fix-term contract, and contingent and temporary work. Self-employment, free-lancing, and other types of nonstandard work contracts challenge traditional notions of occupational position, status consistency, job career, and employment security.

With the advent of economic globalization, pressure towards an increase in return on investment has been growing over the past two decades (39). As a consequence, work pressure increased considerably in several private sectors of national economies, but also in public sectors, due to financial cuts in public expenditures (40). Another consequence of economic globalization concerns the segmentation of the labor market and a related increase in income inequality. On one hand, there is a well-trained, skilled, and flexible workforce with a high level of job satisfaction, fair promotion prospects, and adequate earnings. On the other hand, a large part of the workforce in advanced societies suffers from job insecurity, low wages and salaries, and a low level of safety at work. Less qualified, less mobile, and older workers are more likely to belong to the latter segment (41, 42). With the globalization of labor markets, competition among employees has been increasing, and a growing proportion has been exposed to mergers, downsizing, outsourcing, or redundancy (43).

New directions in analyses of effort–reward imbalance at work

These developments challenge how work stress with relevance to health is conceptualized and measured in several ways. At a basic theoretical level one may question whether social reciprocity in work-related exchange continues to be of critical importance for health and well-being. For instance, with an increase in self-employment and free-lancing, with a growing proportion of people holding two or more jobs, and with the discontinuity

and fragmentation of job careers, the importance of occupational position and related rewards for social identity may diminish. The extension of virtual reality, communication via media, and individualization of task performance are likely to restrict opportunities and importances of direct interpersonal exchange through which nonmonitory rewards such as esteem, recognition, and other types of feedback are transmitted.

Yet evidence from less formalized, more individualized types of social productivity, such as volunteering or providing help to friends and neighbors, indicates that the experience of reciprocity in social exchange continues to be of critical importance for health and well being in adult populations (44). This observation confirms the relevance of socially validated self-esteem among those who are engaged in different types of social productivity. Thus the theoretical basis of the effort–reward imbalance model may remain valid in view of future developments of worklife. However, the means of measuring the model and its single components need to be reconsidered. At least, the following challenges are obvious.

First, more-detailed information will be needed on contextual characteristics to give a more appropriate estimate of the intensity of stressful experience triggered by high effort and low reward at work in a globalized economy. For instance, relevant additional data is required on the type of company in which paid work is performed. Is this a globally acting multinational enterprise with options for recruiting an international workforce and of replacing production sites in a rather short time? Or is it a local factory threatened by economic decline? What is the level of safety standards and of workers' rights? What is the composition of the workforce in terms of qualification, seniority, age, and gender? Where is the organization located with respect to wage differentials, personnel turnover, downsizing, and redundancy, locally and nationally? To what extent is the enterprise affected by business cycles (expansions, overwork, and cut in personnel)?

A second challenge concerns the content of the scales measuring the model. For instance, different sources of increased effort should be distinguished, such as temporal or periodic overtime work, intensification due to new technology, work reorganization (eg, downsizing), or increased competition. It should also be considered whether efforts are based on legitimate or illegitimate demands and to what extent they discriminate between specific groups in terms of relative deprivation (eg, much higher efforts than reference group, but equal pay). What are the consequences if efforts and achievements do not meet a predefined standard? How closely are achievements monitored in the different work environments (including home work)? Does the type of effort requested by the job matter for health (eg, quantitative versus qualitative, psychomental versus emotional effort)?

Similarly, rewards need to be assessed in a more elaborate way. Periodic rewards (wage, salary) should be distinguished from occasional relevant increases or cuts. Major changes in occupational biography could be categorized according to the degree of coercion versus choice and their impact on economic livelihood and security. Direct information about the availability of alternative options in the labor market would help the evaluation of the severity of states of reward deficiency.

A further possible extension relates to the assessment of intrinsic rewards. In theory, it is possible that intrinsic rewards of performing a job well can mitigate to some extent the adverse effects of a lack of sufficient extrinsic gratifications. However, in keeping with a sociological paradigm of reciprocal social exchange, this extension may be less convincing. With respect to the intrinsic component "overcommitment", a differentiation between the two possible sources, informal pressure from one's work environment and truly intrinsic motivation of the person, is desirable although difficult to realize.

Third, with the advent of a globalized labor market, measuring effort–reward imbalance at work in different languages should result in comparable information. Ideally, cultural variations in the core notions of the model and semantic differences resulting from translations should be minimized. This is a very critical issue. Available evidence indicates that, despite satisfactory psychometric properties of translated questionnaires, some sources of variation do exist that are difficult to overcome (45, 46, A Tsutsumi, personal communication). An additional requirement for international comparisons relates to an identical definition of thresholds in the distribution of scale scores. With the use of available evidence mainly from longitudinal studies, it should be feasible to derive normative values indicating stress levels that go along with increased risks of ill health.

Finally, the statistical approaches towards analyzing associations between work stress and health deserve consideration. For instance, in order to include contextual characteristics into the analysis, multilevel modeling might be used. With the application of this approach, a quantitative estimate of the impact of an adverse economic context on the association between work stress and health can be obtained. Such information is of interest not only to science, but to policy as well. A further application concerns appropriate subgroup analyses within the workforce of an enterprise. The social gradient of poor health is an interesting example in this regard, as it is crucial to know whether and to what extent work stress mediates the association between socioeconomic status and health or whether the effects of work stress on health are particularly strong in groups with a lower socioeconomic status (11). In currently unpublished analyses, my coworkers and I found evidence of this latter assumption in a large middle-aged

working population by testing the interaction of the two exposures, socioeconomic status and effort–reward imbalance, using the synergy index. Although work stress was found to be related to reduced health in the total study group, the strongest associations were consistently observed in the lowest socioeconomic group (N Wege, personal communication).

In conclusion, although the model of effort–reward imbalance at work has proved to be successful in explaining the adverse health effects of stressful work, new challenges are emerging with recent changes in the nature of work and with the advent of a globalized economy. It is hoped that further theoretical and methodological developments can keep pace with these developments in order to remain useful for scientific analysis and for policy efforts to improve healthy work on a global scale.

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