

***Effort-reward imbalance at work:
Theory, measurement and evidence***

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Theoretical background

Research on effort-reward imbalance and health is part of a larger scientific program that aims at understanding the contribution of social and psychological factors to human health and disease. More specifically, protective and damaging effects on health produced by peoples' behaviours, cognitions and emotions through core social roles in adult life (work role, civic roles, family roles etc.) are analysed using a specific theoretical and methodological approach.

This theoretical approach is focused on the notion of social reciprocity, a fundamental principle of interpersonal behavior and an 'evolutionary old' grammar of social exchange. Social reciprocity is characterized by mutual cooperative investments based on the norm of return expectancy where efforts are equalized by respective rewards. Failed reciprocity resulting from a violation of this norm elicits strong negative emotions and sustained stress responses because it threatens this fundamental principle.

The model of effort-reward imbalance (ERI) claims that failed reciprocity in terms of high efforts spent and low rewards received in turn is likely to elicit recurrent

negative emotions and sustained stress responses in exposed people.

Conversely, positive emotions evoked by appropriate social rewards promote well-being, health and survival.

A major specification of this theoretical perspective concerns the work role, and in particular its contractual basis. So far, a majority of research evidence concerns ERI at work. More recently, this perspective has been applied to additional social roles in adult life (for further information please [click here](#)).

According to the model, effort at work is spent as part of a social contract that reciprocates effort by adequate reward. Rewards are distributed by three transmitter systems: money, esteem, and career opportunities including job security. Each one of these components of work-related rewards was shown to matter for health.

The model of ERI at work claims that an imbalance between (high) effort and (low) reward is maintained under the following conditions: 1. Work contracts are poorly defined or employees have little choice of alternative workplaces (e.g. due to low level of skill, lack of mobility, precarious labor market); 2. employees may accept this imbalance for strategic reasons (this strategy is mainly chosen to improve future work prospects by anticipatory investments); 3. the experience of 'high cost / low gain' at work is frequent in people who exhibit a specific cognitive and motivational pattern of coping with demands characterized by excessive work-related commitment ('overcommitment'). Overcommitted men and women suffer from inappropriate perceptions of demands and of their own coping resources more often than their less involved colleagues, because perceptual distortion prevents them from accurately assessing cost-gain relations. A graphic representation of the model is given in the following figure.



The following three hypotheses are derived from the ERI model:

1. An imbalance between high effort and low reward (non-reciprocity) increases the risk of reduced health over and above the risk associated with each one of the components.
2. Overcommitted people are at increased risk of reduced health (whether or not this pattern of coping is reinforced by work characteristics).
3. Relatively highest risks of reduced health are expected in people who are characterized by conditions (1) and (2).

Key publications

1. Siegrist J (1996). Adverse health effects of high effort - low reward conditions at work. *Journal of Occupational Health Psychology*, 1, 27-43.
2. Siegrist J (2000). Place, social exchange and health: proposed sociological framework. *Social Science & Medicine*, 51, 1283-1293.
3. Siegrist J (2002): Effort-reward Imbalance at Work and Health. In: P Perrewe & D Ganster (Eds.). *Research in Occupational Stress and Well Being*, Vol. 2: Historical and Current Perspectives on Stress and Health. New York: JAI Elsevier, 261-291.
4. Siegrist J & Marmot M (2004). Health inequalities and the psychosocial environment - two scientific challenges. *Social Science & Medicine*, 58, 8, 1463-1473.
5. Siegrist J, Theorell T (2006). Socioeconomic position and health: the role of work and employment. In: J Siegrist, M Marmot (Eds.). *Social*

Inequalities in Health. New evidence and policy implications. Oxford:
Oxford University Press.

Measurement

In principle, different measurement approaches towards assessing ERI are feasible. To some extent, contextual information (e.g. job descriptions, level of salary, career mobility, job loss) can be used. However, core aspects of the model concern experiences and perceptions of working people. Therefore, self-report data are of core importance. These data can be acquired through qualitative interviews, ecological momentary assessments, standardized questionnaires or structured interviews.

In large scale social epidemiological research an economic measure in terms of a psychometrically well justified standardized questionnaire has proven to be particularly useful. In this tradition, the ERI model has been operationalized as a standardized self-report measure containing 23 Likert-scaled items in its established short version. These items define three unidimensional scales: 'effort' (6 items), 'reward' (11 items), and 'overcommitment' (6 items) with each item rated on a 5 point (effort, reward) or 4 point (overcommitment) Likert scale respectively. Examples of items are 'I have constant time pressure due to a heavy work load' (effort); 'My job promotion prospects are poor' (reward); 'Work rarely lets me go, it is still on my mind when I go to bed' (overcommitment). For access to information on full wording of the scales (in several languages), on psychometric properties of the scales and on analysis of ERI data please [click here](#).

Key publications

1. Siegrist J, Starke D, Chandola T, Godin I, Marmot M, Niedhammer I & Peter R (2004). The measurement of Effort-Reward Imbalance at work: European comparisons. *Social Science & Medicine*, 58, 8, 1483-1499 (identified as fast breaking paper by ISI; see Essential Science Indicators).
2. de Jonge J, van der Linden S, Schaufeli W, Peter R, Siegrist J (2008). Factorial invariance and stability of the effort-reward imbalance scales: A longitudinal analysis of two samples with different time lags. *International Journal of Behavioral Medicine*, 15, 62-72.

Other Publications

1. Niedhammer I, Siegrist J, Landre M, Goldberg M, Leclerc A (2000): Etude des qualities psychométriques de la version française du modèle du D'équilibre Efforts/Récompenses. *Revue d'Epidemiologie et de Santé publique*, 48, 419 - 437.
2. Hanson EKS, Schaufeli W, Vrijkotte T, Plomp NH & Godaert GLR (2000). The validity and reliability of the Dutch effort-reward imbalance questionnaire. *Journal of Occupational Health Psychology*, 5, 142-155.
3. Tsutsumi A, Ishitake T, Peter R, Siegrist J, Matoba T (2001): The Japanese version of the Effort-Reward-Imbalance Questionnaire: a study in dental technicians. *Work & Stress*, 15, 86-96.
4. Rödel, A, Siegrist, J, Hessel, A, & Brähler, E (2004). Fragebogen zur Messung beruflicher Gratifikationskrisen. Psychometrische Testung an einer repräsentativen deutschen Stichprobe. *Zeitschrift für Differentielle und Diagnostische Psychologie*, 25, 4, 227-238.
5. Li, J, Yang, W, Cheng, Y, Siegrist, J, Cho, SI (2005): Effort-reward imbalance at work and job dissatisfaction in Chinese health care workers: A validation study. *International Archives of Occupational and Environmental Health*, 78, 198-204.
6. Weyers S, Peter R, Boggild H, Jeppesen HJ & Siegrist J (2006). Psychosocial work stress is associated with poor self-rated health in Danish nurses: a test of the effort-reward imbalance model. *Scandinavian Journal of Caring Sciences*, 20, 26-34.
7. Johnston JM (2006). Using computerized ambulatory diaries for the assesment of job characteristics and work-related stress in nurses. *Work & Stress*, 20, 163-172.
8. Fernández-López JA, Fernández-Fidalgo M, Martín-Payo R & Rödel A (2006). Análisis factorial confirmatorio de la versión española del cuestionario "effort-reward imbalance", de medida del estrés laboral [Confirmatory factor analysis of the Spanish version of the effort-reward imbalance questionnaire]. *Atención Primaria*, 38, 465-466 (in Spanish).
9. Eum KD, Li J, Lee HE, Kim SS, Paek D, Siegrist J, Cho SI (2007). Psychometric properties of the Korean version of the effort-reward imbalance questionnaire: a study in a petrochemical company. *International Archives of Occupation and Environmental Medicine*.

10. Preckel D, Meinel M, Kudielka BM, Haug HJ, Fischer JE (2007). Effort-reward-imbalance, overcommitment and self-reported health: Is it the interaction that matters? *Journal of Occupational and Organizational Psychology*, 80, 91-107.
 11. Magnavita N (2007). Two tools for health surveillance of job stress: the Karasek Job Content Questionnaire and the Siegrist Effort Reward Imbalance Questionnaire. *G Ital Med Lav Ergon*, 29, 667-70 (in Italian).
 12. Kinnunen U, Feldt T, Mäkikangas A (2008). Testing the Effort-Reward Imbalance Model among Finnish managers: The role of perceived Organizational support. *Journal of Occupational Health Psychology*. 13, 114-127.
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Selected publications on research evidence

1. Reviews

The following reviews provide a summary of research on associations between ERI at work and health:

1. Siegrist J (2002): Effort-reward Imbalance at Work and Health. In: P Perrewe & D Ganster (Eds). *Research in Occupational Stress and Well Being, Vol. 2: Historical and Current Perspectives on Stress and Health*. New York: JAI Elsevier, 261-291.
2. Marmot M, Theorell T & Siegrist J (2002): Work and coronary heart disease. In S Stansfeld & M Marmot (Eds). *Stress And The Heart*. London: BMJ Books, 50-71.
3. Tsutsumi A, Kawakami N (2004): A review of empirical studies on the model of effort–reward imbalance at work: reducing occupational stress by implementing a new theory. *Social Science & Medicine*, 59, 2335-2359.
4. Van Vegchel N, de Jonge J, Bosma H, Schaufeli W (2005). Reviewing the effort-reward imbalance model: drawing up the balance of 45 empirical studies. *Social Science & Medicine*, 60, 1117-1131.
5. Siegrist J (2005). Social reciprocity and health: New scientific evidence and policy implications. *Psychoneuroendocrinology*, 30, 1033-1038.
6. Marmot M, Siegrist J & Theorell T (2006): Health and the psychosocial environment at work. In M Marmot & R. Wilkinson (Eds). *Social Determinants of Health*. Oxford: Oxford University Press, 97-130.

2. Cardiovascular risk and diseases (including Type-II-diabetes)

Most research on the association between ERI at work and health was done on cardiovascular diseases. Selected examples of prospective studies are:

1. Bosma H, Peter R, Siegrist J & Marmot M (1998). Two alternative job stress models and the risk of coronary heart disease. *American Journal of Public Health*, 88, 68 - 74.
2. Kivimäki M, LeinoArjas P, Luukkonen R, Riihimäki H, Vahtera J & Kirjonen J (2002). Work stress and risk of cardiovascular mortality: prospective cohort study of industrial employees. *British Medical Journal*, 325, 857 - 860.
3. Kuper H, Singh-Manoux A, Siegrist J & Marmot M (2002). When reciprocity fails: effort-reward imbalance in relation to coronary heart disease and health functioning within the Whitehall II study. *Occupational Environmental Medicine*, 59, 777 - 784.
4. Kumari M, Head J & Marmot M (2004). Prospective study of social and other risk factors for incidence of type 2 diabetes in the Whitehall II study. *Archives of Internal Medicine*, 164, 1873-1880.
5. Chandola T, Siegrist J, Marmot M (2005). Do changes in effort-reward imbalance at work contribute to an explanation of the social gradient in angina? *Occupational and Environmental Medicine*, 62, 223-230.
6. Smith LA, Roman A, Dollard MF, Winefield AH & Siegrist J (2005). Effort-reward imbalance at work: The effects of work stress on anger and cardiovascular disease symptoms in a community sample. *Stress and Health*, 21, 113-128.
7. Peter R, Hammarstrom A, Hallqvist J, Siegrist J & Theorell T (2006). Does occupational gender segregation influence the association of effort-reward imbalance with myocardial infarction in the SHEEP Study? *International Journal of Behavioral Medicine*, 13, 34-43.
8. Hintsanen M, Elovainio M, Puttonen S, Kivimäki M, Koskinen T, Raitakari OT, Keltikangas-Järvinen L (2007). Effort-Reward Imbalance, heart rate variability: The cardiovascular risk in young Finns Study. *International Journal of Behavioral Medicine*, 14, 202-21.
9. Utsugi M, Saijo Y, Yoshioka E, Sato T, Horikawa N, Gong Y, Kishi R (2008). Relationship between two alternative occupational stress models and

arterial stiffness: a cross-sectional study among Japanese workers. *Int Arch Occup Environ Health*, DOI 10.1007/s0020-008-0319-z.

10. Wege N, Dragano N, Moebus S, Stang A, Erbel R, Jöckel KH, Siegrist J (2008). When does work stress hurt? Testing the interaction with socioeconomic status in the Heinz Nixdorf Recall Study. *J Epidemiol Community Health*, 62, 338-341.

For further results (case-control, cross-sectional, consecutive studies) see above mentioned reviews. For results on stress-related mechanisms see below (6).

3. Psychiatric disorders

Concerning ERI at work and psychiatric disorders (mainly depression), there is evidence from prospective and cross-sectional investigations (selection):

1. Stansfeld SA, Fuhrer R, Shipley MJ & Marmot MG (1999). Work characteristics predict psychiatric disorder: prospective results from the Whitehall II study. *Occupational and Environmental Medicine*, 56, 302-307.
2. Tsutsumi A, Kayaba K, Theorell T & Siegrist J (2001): Association between job stress and depression among Japanese employees threatened by job loss in comparison between two complementary job-stress models. *Scandinavian Journal of Work Environment and Health*, 27, 146-153.
3. Pikhart H, Bobak M, Pajak A, Malyutina S, Kubinova R, Topor R, Sebakova H, Nikitin Y & Marmot M (2004). Psychosocial factors at work and depression in three countries of Central and Eastern Europe. *Social Science & Medicine*, 58, 8, 1475-1482.
4. Godin I, Kittel F, Coppieters Y & Siegrist J (2005). A prospective study of cumulative job stress in relation to mental health. *BMC Public Health*, 5, 67.
5. Kivimäki M, Vahetera J, Elovainio M, Virtanen M, Siegrist J (2007). Effort-reward imbalance, procedural injustice and relational injustice as psychosocial predictors of health: Complementary or redundant models? *Occup Environ Med*, published online first: 25 Jan. 2007.
6. Rystedt LW, Devereaux K, Sverke M (2007). Comparing and combining the demand-control-support model and the effort-reward imbalance model to predict long-term mental strain. *European Journal of Work and*

Organizational Psychology 16, 261-278 (online = DOI: 10.1080/13594320601182311).

7. Bourbonnais R, Jauvin N, Dussault J, Vézina M (2007). Psychosocial work environment, interpersonal violence at work and mental health among correctional officers. *Int J Law Psychiatry*, 30, 355-68.
8. Dragano N, He Y, Moebus S, Jöckel KH, Erbel R, Siegrist J for the Heinz Nixdorf Recall Study (2008) Two models of job stress and depressive symptoms: results from a population based study. *Social Psychiatry and Psychiatric Epidemiology*, 43, 72-78.

More recently, addictive behaviour has been explored as health outcome of ERI. An example of prospective research evidence is:

6. Head J, Stansfeld S & Siegrist J (2004). Psychosocial work environment and alcohol dependence. *Occupational & Environmental Medicine*, 61, 219-224.

4. Symptoms and subjective health

A large number of reports analyse associations of ERI with self-reported data on health and well-being (for review see van Vegchel et al. 2004). Some more recent respective publications are:

1. Joksimovic L, Siegrist J, Meyer-Hammer M, Peter R, Franke B, Klimek W, Heinzten M, Strauer BE (1999). Overcommitment predicts restenosis after coronary angioplasty in cardiac patients. *International Journal of Behavioral Medicine*, 22, 441-449.
2. van Vegchel N, de Jonge J, Meijer T, et al. (2001). Different effort constructs and effort-reward imbalance: effects on employee well-being in ancillary health care workers. *Journal of Advanced Nursing*, 34, 128-36.
3. Pikhart H, Bobak M, Siegrist J, Pajak A, Rywik S, Kyshegyi J, Gostautas A, Skodova Z & Marmot M (2001). Psychosocial work characteristics and self-rated health in four post-communist countries. *Journal of Epidemiology and Community Health*, 55, 624-630.
4. Niedhammer I, Teck ML, Starke D & Siegrist J (2004). Effort-Reward Imbalance Model and self reported health: Cross-sectional and prospective results from the GAZEL Cohort. *Social Science & Medicine*, 58, 8, 1531-1541.

5. Dragano N, Verde PE & Siegrist J (2005). Organisational downsizing and work stress: testing synergistic health effects in employed men and women. *Journal of Epidemiology and Community Health*, 59, 694-699.
6. Ertel M, Pech E, Ullsperger P & Knesebeck Ovd (2005). Adverse psychosocial working conditions and subjective health in freelance media workers. *Work & Stress*, 19, 293-299.
7. Kudielka BM, Hanebuth D, von Kanel R, Gander ML, Grande G & Fischer JE (2005). Health-related quality of life measured by the SF12 in working populations: Associations with psychosocial work characteristics. *Journal of Occupational Health Psychology*, 10, 429-440.
8. Li J, Yang W & Cho Si (2006). Gender differences in job strain, effort-reward imbalance, and health functioning among Chinese physicians. *Social Science & Medicine*, 62, 1066-1077.
9. Janzen BL, Muhajarine N, Zhu T (2007). Effort-reward imbalance, overcommitment, and psychological distress in Canadian police officers. *Psychological Reports* 100, 525-530.
10. Wada K, Sakata Y, Theriault G, Aratake Y, Shimizu M, Tsutsumi A, Tanaka K, Aizawa Y (2007). Effort-reward imbalance and social support are associated with chronic fatigue among medical residents in Japan. *Int Arch Occup Environ Health* 81, 331-336.
11. Mäki K, Vahtera J, Virtanen M, Elovainio M, Keltikangas-Järvinen L, Kivimäki M (2008). Work stress and new-onset migraine in a female employee population. *Cephalalgia*, 28, 18-25.
12. Buddeberg-Fischer B, Klaghofer R, Stamm M, Siegrist J, Buddeberg C (2008). Work stress and reduced health in young physicians: prospective evidence from Swiss residents. *Int Arch Occup Environ Health*, DOI 10.1007/s00420-008-0303-7.

5. Sickness absence

Both short-term and long-term sickness absence are explored in association with ERI. Examples of respective research are:

1. Peter R & Siegrist J (1997) Chronic work stress, sickness absence and hypertension in middle managers: general or specific sociological explanation? *Social Science & Medicine*, 45, 1111-1120.

2. Godin I & Kittel F (2004). Differential economic stability and psychosocial stress at work: associations with psychosomatic complaints and absenteeism. *Social Science & Medicine*, 58, 8, 1543-1553.
3. Head J, Kivimäki M, Siegrist J, Ferrie J, Vahtera J, Shipley MJ, Marmot M (2007). Effort-reward imbalance and relational injustice at work predicts sickness absense: the Whitehall II Study. *Journal of Psychosomatic Research*, 63, 433-440.
4. Fahlén G, Goine H, Edlund C, Arrelöv B, Knutsson A, Peter R (2008). Effort-reward imbalance, "locked in" at work, and long-term sick leave. *Int Arch Occup Environ Health* (in press).

6. Stress-related mechanisms

Several research strategies are realized in order to explain psychobiological mechanisms linking ERI-induced stressful experience with adverse health outcomes. These research strategies include ambulatory monitoring in naturalistic settings, experimental studies and analyses of innovative biomedical markers in high risk groups identified in the context of epidemiological studies. Selected recent publications include:

1. Vrijkotte TGM, van Doornen LJP & de Geus EJC (1999): Work stress and metabolic and hemostatic risk factors. *Psychosomatic Medicine*, 61, 796 - 805.
2. Vrijkotte TG, van Dooren LJ & de Geus EJ (2000). Effects of work stress of ambulatory blood pressure, heart rate, and heart rate variability. *Hypertension*, 35, 4, 880.
3. Steptoe A, Siegrist J, Kirschbaum C & Marmot M (2004). Effort-reward imbalance, overcommitment, and measures of cortisol and blood pressure over the working day. *Psychosomatic Medicine*, 66, 323-329.
4. Siegrist J, Menrath I, Stöcker T, Klein M, Kellermann T, Shah NJ, Zilles K & Schneider F (2005). Differential brain activation according to chronic social reward frustration. *NeuroReport*, 16, 1899-1903.
5. Hamer MP, Williams EM, Vuonovirta RM, Giacobazzi PP, Gibson ELP & Steptoe AD (2006). The effects of effort-reward imbalance on inflammatory and cardiovascular responses to mental stress. *Psychosomatic Medicine*, 68, 408-413.

6. Bellingrath S, Weigl T, Kudielka BM (2008). Cortisol dysregulation in school teachers in relation to burnout, vital exhaustion, and effort-reward imbalance. *Biol Psychol*, 78, 104-113.
7. Wirtz PH, Siegrist J, Rimmele U, Ehlert U (2008). Higher overcommitment to work is associated with lower norepinephrine secretions before and after acute psychosocial stress in men. *Psychoneuroendocrinology* 33, 92-99.

7. Other outcomes

Research on ERI at work has also been extended to outcomes that are not (or at least not directly) associated with health. Examples include job satisfaction, burnout, and deviant behaviour, e.g.:

1. Jonge J de, Bosma H, Peter R & Siegrist J. (2000). Job strain, effort-reward imbalance and employee well-being: a large scale cross-sectional study. *Social Science & Medicine*, 50, 1317-1327.
2. Bakker AB, Killmer CH, Siegrist J, Schaufeli WB (2000): Effort-reward imbalance and burnout among nurses. *Journal of Advanced Nursing*, 31, 4, 884 - 891.
3. Hasselhorn HM, Tackenberg P, Peter R and the NEXT Study Group (2004). Effort–reward imbalance among nurses in stable countries and in countries in transition. *International Journal of Occupational and Environmental Health*, 10, 401–408.
4. Kouvonen A, Kivimäki M, Cox SJ, Cox T & Vahtera J (2005). Relationship between work stress and body mass index among 45,810 female and male employees. *Psychosomatic Medicine*, 67, 577-583.
5. Kouvonen A, Kivimäki M, Virtanen M, Heponiemi T, Elovainio M, Pentti J, Linna A & Vahtera J (2006). Effort-reward imbalance at work and the co-occurrence of lifestyle risk factors: cross-sectional survey in a sample of 36,127 public sector employees. *BMC Public Health*, 6, 24.
6. Siegrist J, Wahrendorf M, dem Knesebeck O, Jurges H & Börsch-Supan A (2006). Quality of work, well-being, and intended early retirement of older employees-baseline results from the SHARE Study. *The European Journal of Public Health* 17(1), 62-68.
7. Martinson BC, Anderson MS, Crain AL & de Vries R (2006). Scientists' perceptions of organizational justice and self-reported misbehaviors. *Journal of Empirical Research on Human Research Ethics*, 1, 51-66.

8. Rödel, A., Siegrist, J., Hessel, A. & Brähler, E. (2004). Psychometrische Testung des Fragebogens zur Messung beruflicher Gratifikationskrisen an einer repräsentativen deutschen Stichprobe. *Zeitschrift für Differentielle und Diagnostische Psychologie*, 25, 227-238.
9. Rugulies R, Krause N (2007). Effort-reward imbalance and incidence of low back and neck injuries in San Francisco transit operators. *Occup. Environ. Med* (online = doi:10.1136/oem.2007.035188).
10. Hoggan BL, Dollard MF (2007). Effort-reward imbalance at work and driving anger in an Australian community sample: Is there a link between work stress and road rage? *Accident Analysis and Prevention*, 39, 1286-1295.
11. d'Errico, L Punnett, M Cifuentes, J Boyer, J Tessler, R Gore, P Scollin, C Slatin (2007). Promoting Healthy and Safe Employment In Healthcare Research Team Hospital injury rates in relation to socioeconomic status and working conditions. *Occup Environ Med*, 64, 325-333.
12. Lee MS, Paek D, Eum KD, Siegrist J, Li J, Lee HE, Cho SI (2008). Paternal work stress and prolonged time to pregnancy. *Int Arch Occup Environ Health* (in press).

Intervention

The model of ERI at work is useful in designing worksite stress prevention and health promotion programs. As a first step, stressful conditions at work can be measured in a standardized way using the psychometrically validated questionnaire available in a number of languages. As a second step, interventions measures can be derived from the model at the personal/interpersonal level and at the structural level.

At the personal/interpersonal level, techniques of stress management including stress inoculation through strengthening of psychological and interpersonal resources are indicated. In order to be effective these techniques need to address cognitions, attitudes and work-related motivations in addition to the rather non-specific relaxation techniques. Improved self-observation and perception of arousal, coping with anger and reinforced self-reliance are important elements of this type of intervention. Another application of stress prevention at the interpersonal level concerns the improvement of leadership

skills among supervisors and superiors, in particular the awareness of an important role of esteem, recognition and appropriate feedback, as indicated by the ERI-model.

Structural measures of work site health promotion derived from this theoretical approach include the implementation of models of gain-sharing and of non-monitory incentives including options of flexible work time arrangements, comparatively high compensation contingent on performance, tailoring of promotion prospects and status according to achievements, improved job security and further measures of organisational and contractual fairness.

It is important to note that the creation of healthy work places produces economic benefits in the long run, in addition to beneficial effects on health and well being. Policy implications of the ERI model are not restricted to occupational life, but may be extended to the design of voluntary work and to ways of improving social capital within communities.

Key publications

1. Aust B, Peter R, Siegrist J, et al. (1997). Stress Management in bus drivers: a pilot study based on the model of effort-reward imbalance. *International Journal of Stress Management* 4, 297-305.
2. Siegrist K & Silberhorn (1998). *Stressabbau in Organisationen*. Münster: Litverlag.
3. Siegrist J (2000): A Theory of Occupational Stress. In: Dunham, J. (Ed.): *Stress in the Workplace. Past, Present and Future*. London: Whurr Publishers, 63-66.
4. Bourbonnais R, Brisson C, Vinet A, Vézina M, Lower A (2006) Development and implementation of a participative intervention to improve the psychosocial work environment and mental health in an acute care hospital. *Occup Environ Med* 63: 326-34.