

PEOPLE AND WORK • RESEARCH REPORTS 28

MENTAL WELL-BEING AT WORK

A Sign of a Healthy Organisation and a Necessary
Precondition for Organisational Development

by

Kyösti Waris

ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Social Sciences of the University of Turku for public criticism in the Mikro Auditorium of the University of Turku on September 24, 1999, at 12 o'clock noon.

Finnish Institute of Occupational Health
Helsinki 1999

MENTAL WELL-BEING AT WORK

A Sign of a Healthy Organisation and a Necessary
Precondition for Organisational Development

Kyösti Waris

Finnish Institute of Occupational Health, Helsinki 1999

PEOPLE AND WORK • RESEARCH REPORTS 28

To all working people and the developers of organisations

Acknowledgements

This study was started in the National Board of Labour Protection, Tampere, which supported it by offering materials and statistical programs for the author's use. In this connection I especially want to thank Heikki Loppi in the Ministry of Social Affairs and Health for giving me a possibility of using working time for the project. I also thank Reino Kanerva in the Ministry of Social Affairs and Health for his positive attitude towards the project and for offering the materials to be needed.

I wish to thank Pirjo Saarni in Psycon HR-Consulting Co Helsinki, who assisted me in the collection of the data as well as Kirsi Kyrkkö in the Ministry of Social Affairs and Health and Marko Niinimäki in CERN Geneva, who took care of the input and storage of the collected raw data in the questionnaires. The latter of them also instructed me in the use of basic computer programs.

The data was collected by the kind assistance of Posts and Telecommunications of Finland and the regional inspectorates of the Occupational Safety and Health Administration. I wish to thank their personnel, who made it possible to carry out this study. Although many of the employees of those organisations are not working any more, their assistance has been most important and fruitful for the science of psychology. Especially I want to thank Pertti Heinsalmi in Loviisa Region Municipal Health Centre, whose support was of great importance at the beginning of the project in Posts and Telecommunications of Finland.

I am most grateful to all who have given their advice and assistance in the scientific problems during the course of the study. Especially I wish to thank Esko Keskinen, my supervisor, at the University of Turku, whose advice has been irreplaceable at the seminars of the Department of Psychology during the course of the study. I want to thank Tapio Nummenmaa at the University of Tampere and Marjatta Vanhalakka-Ruoho at the University of Joensuu for their valuable advice in the early phases of the project as well as Pekka Niemi at the University of Turku for his favourable attitude towards the study in its later phases. I also give my warmest thanks to Esko Leskinen and Jouni Markkula at the University of Jyväskylä, Markku Korhonen at the University of Helsinki, Kimmo Mikola in the Ministry of Social Affairs and Health and Arto Kallinen for their advice in statistical and computational problems.

I express my warmest thanks to Eila Järvenpää, Veikko Teikari and Matti Vartiainen at Helsinki University of Technology and Markku Ojanen at the University of Tampere, who kindly gave their advice and methods to be used in the study. I am very much obliged to Markku Verkasalo at the University of Helsinki for his comments concerning the Rosenberg self-esteem scale and its Finnish translation.

I extend my most respectful thanks to Eila Järvenpää and Matti Vartiainen who as the official preliminary examiners of the Faculty of Social Sciences of the University of Turku gave their highly competent, quick and constructive critique concerning the manuscript of the dissertation.

I also wish to thank Raija Kalimo in the Finnish Institute of Occupational Health for her help as a scientific editor in *Työ ja Ihminen* as well as all those who have worked for the publication of the original articles and the dissertation in practice.

Finally, I want to thank of my fellow workers and friends, all who have supported me during the long course of the project. I express my warmest thanks to my parents, Lea and Armas Waris, for their encouragement during the process. Especially I want to express my gratitude to my wife Anja as well as my daughter Anne and my son Marko, who have given their support to me and shown great patience and understanding towards my study.

Tampere, July 1999

Kyösti Waris

Preface

... the general dynamic trend of an organism is toward an increase of autonomy...The human being has a characteristic tendency toward self-determination, that is, a tendency to resist external influences and to subordinate the heterogeneous forces of the physical and social environment to its own sphere of influence. (Angyal, 1941)

Working conditions can enhance or impair a person's mental or physical resources to meet the demands of work and life. A renewal of organisations is required for changing their structures and functioning to more appropriate for the human being. (The author)

The importance of control over one's work in the regulation and prevention of stress has been shown in many studies. Although the influence of the objective working environment on one's mental well-being has been seen as important, arguments have also been presented about the supremacy of personal factors in the perception of working environment. In general, the studies on the subject have been based on the assumptions of the importance of individual or specific contextual factors in the process. Knowledge of the interrelationships or the influences between the factors - typical of a human being in general - has been missing.

Cognitions like the functions of information processing and mental models in mastering the environment have been considered as important. Although emotions have been included in cognition nowadays, information about the interrelationships of these factors has been missing.

The focus of interest in this study was to clarify the general interrelationships of the external and internal factors in perceiving and controlling the working environment. One object of interest was also to find out the mutual interrelationships of personal factors in the perceptive processes on the level of general principles.

List of Studies

This review is based on several studies conducted by the data of the following publications and the additional studies after them. The publications are referred to in the text by "Study I - Study IV" and the additional studies by "Supplementary Studies A-D". The Supplementary Studies have been carried out at the beginning of the year 1998, and they have not been published before.

- | | |
|-----------|---|
| Study I | Waris, K. (1994). Job Diagnostic Survey (JDS) -menetelmän luotettavuus työn ydinpiirteiden arvioinnissa. Reliability of the Job Diagnostic Survey (JDS) in evaluating the core traits of work. <i>Työ ja Ihminen</i> , 3 , 183-195. |
| Study II | Waris, K. (1995). EZ (Eigenzustand)-menetelmä kuormittuneisuuden mittarina: menetelmän luotettavuuden arviointia. The EZ (Eigenzustand) method as an assessment instrument of work load: Evaluating the validity and reliability of the method. <i>Työ ja Ihminen</i> , 3 , 189-197. |
| Study III | Waris, K. (1996). Työolojen omaehtoinen kehittäminen ja henkinen kuormittuneisuus. Organisational self-improvement and mental work load. <i>Työ ja Ihminen</i> , 3 , 179-197. |
| Study IV | Waris, K. (1997). Toimiva työyhteisö ja sopivasti haasteellinen työ lisäävät motivaatiota ja toimintakykyä sekä parantavat itsearvostusta. A well-functioning organisation and properly demanding work increase motivation, decrease mental strain, and improve self-esteem. <i>Työ ja Ihminen</i> , 2 , 94-114. |

Supplementary Studies:

- A Relationship Between Job Characteristics and Individual Factors.
- B The Impact of Willingness to Develop Working Conditions on Job Characteristics.
- C Organisational Functioning, Job Satisfaction, Willingness to Develop the Working Conditions, and Mental Strain.
- D Structural Relationships Between Individual Factors.

The review with the original publications (appendices) and Supplementary Studies constitutes the manuscript of the academic dissertation of the author.

List of Abbreviations

DCM	the Demand/Control Model
DCSM	the Expanded Demand/Control Model
EZ	the Eigenzustand method
JDS	the Job Diagnostic Survey method
JCM	the Job Characteristics Model
SCD	the Sense of Competence for Development
SIP	the Social Information Processing Model
WMP	Work Motivation Potential
WHO	World Health Organisation

Contents

ABSTRACT	1
1. INTRODUCTION	3
JDS: Measuring Job Characteristics	3
EZ: Measuring Short-Term Mental Work Load	7
Organisational Self-Improvement	10
The Role of Organisational Functioning and the Characteristics of Work in Perceiving Mental Work Load	13
The Role of Individual Factors in the Perception of Working Environment.....	15
Job Characteristics	15
Organisational Functioning	16
Cognitions and Emotions	17
Perceived Working Environment and Worker's Health	18
Problems	19
2. METHODS	20
Target Organisations	20
The Main Statistical Methods	22
Measures	24
Procedures	26
Statistical Methods	28
Cross-Sectional Data	29
Longitudinal Data	29
3. RESULTS	30
Reliability and Validity of the Job Diagnostic Survey (JDS)	30
Reliability and Validity of the EZ (Eigenzustand) Method	30
Preconditions for Successful Organisational Self-Improvement	30
The Interrelationships Between Organisational Functioning, Job Characteristics and Mental Well-Being	32
Organisational Functioning and Mental Well-Being	32
Job Characteristics and Mental Well-Being	35
The Role of Individual Factors in the Perception of Working Environment	36
Relationships Between Individual Factors	38

Working Environment, Individual Factors, and Health	40
Article 1. The Reliability of the Job Diagnostic Survey (JDS)	
in Evaluating the Core Traits of Work	40
Targets, Materials and Methods	40
Reliability of the Scales	42
Reliability of the Factor Structure	42
Evaluation of the Job Characteristics Model (JCM)	43
Article 2. The EZ (Eigenzustand) Method as an Assessment Instrument	
of Work Load: Evaluating the Validity and Reliability of the Method	43
Targets, Materials and Methods	43
Reliability of the Scales	44
Reliability of the Factor Structure	44
Statistical Analyses	45
Article 3. Organisational Self-Improvement and Mental Work Load	45
Targets, Materials and Methods	45
Changes in Organisational Functioning	47
Organisational Development	48
Process Evaluations of the Development Groups	48
Changes in Mental Well-Being (Work Load)	48
Article 4. A Well-Functioning Organisation and Properly Demanding	
Work Increase Motivation, Decrease Mental Strain, and Improve	
Self-Esteem.....	49
Targets, Materials and Methods.....	49
Connections Between Variables and a Preliminary Structural	
Analysis.....	50
Confirmation of the Discovered Factors	50
The Impacts of Organisational Functioning and Job Challenge	
and Control on Mental State	51
The Influence of Job Satisfaction, Job Control and Willingness	
to Develop the Working Conditions on Mental Strain and	
Self-Esteem.	52
Changes in Sick Absenteeism	52
Connections of Sick Absenteeism With Job Characteristics	
and Individual Factors	53
Connections of Context Variables with Mental State,	
Job Characteristics, Self-Esteem and Sick Absenteeism	53
The Supplementary Studies	54
A Relationship Between Job Characteristics and Individual	
Factors	54

B The Impact of Willingness to Develop Working Conditions on Job Characteristics.....	55
C Organisational Functioning, Job Satisfaction, Willingness to Develop Working Conditions, and Mental Strain	55
D Structural Relationships between Individual Factors	57
4. DISCUSSION	58
The Main Findings	58
The Methods: Confirming the Old and Acquiring New Knowledge	60
The Job Diagnostic Survey (JDS):	
The Interface Between External and Internal Factors	60
The Eigenzustand Method (EZ): New Support to the Theoretical Basis	62
Organisational Self-Improvement Possible on Certain Preconditions	64
The Objective Working Environment and Worker's Perception	69
A Structural Perspective	69
A Contextual Approach	69
An Individual Viewpoint	70
An Intermediary Point of View	71
The Influence of Organisational Functioning on a Worker's Mental Well-Being	73
The Role of Leadership	74
Collaboration and Social Support	75
The Importance of Structural Factors	75
Short-Term Mental Work Load and Self-Esteem	76
Job Characteristics and Mental Well-Being	78
Job Satisfaction as an Expression of Organisational Functioning	80
The Sense of Competence for Development (SCD) as a Mediator	81
Self-Esteem and the Perception of Organisational Functioning	83
Self-Esteem: a Personal Resource for Coming off in a Working Environment	85
Emotional and Cognitive Factors: A Functional Unity	86
Job Characteristics and Sick Absenteeism	87
Self-Esteem and Sick Absenteeism.....	89
Co-Operation and Sick Absenteeism	90
General Conclusions	92
5. REFERENCES	94
ORIGINAL PUBLICATIONS	111

Abstract

Waris, K. (1999). Mental Well-Being at Work. A Sign of a Healthy Organisation and a Necessary Precondition for Organisational Development. University of Turku, Department of Psychology, Finland.

One of the aims of the study was to clarify the reliability and validity of the Job Diagnostic Survey (JDS) and the Eigenzustand (EZ) method as measures of the objective characteristics of work and short-term mental work load in the Finnish data. The reliability and validity were examined taking into consideration the theoretical backgrounds of the methods and the reliability of the measurements.

The methods were used for finding out the preconditions for organisational development based on self-improvement and clarifying the impacts of working environment (organisational functioning and job characteristics) on a worker's mental state and health. The influences were examined on a general level - regardless of individual personal or specific contextual factors. One aim was also to clarify how cognitions and emotions are intertwined and how they influence a person's perception of the working environment.

The data consisted of 15 blue-collar organisations in the public sector. The organisations were divided in target and comparison groups depending on the research frames. The data was collected by questionnaires by post. The exploratory and confirmatory factor analyses (Lisrel) were used as the main statistical methods in examining the structures of the methods and impacts between the variables.

It was shown that it is possible for organisations to develop their working conditions themselves on specific preconditions. The advance of the development processes could be shown by the amount of the development activity as well as by the changes of the mental well-being (ability to act) and sick absenteeism of the personnel.

It was found that the JDS and the EZ methods were reliable and valid measures in the Finnish data. It was shown that, in addition to the objective working environment (organisational functioning and job characteristics), also such a personal factor as self-esteem influences a person's perception of mental work load. However, the influence did not seem to be direct. The importance of job satisfaction as a general indicator of perceived working conditions was emphasised. Emotional and cognitive factors were found

to be functionally intertwined constituting a common factor. Organisational functioning and the characteristics of work had connections with a person's health measured by sick absenteeism.

1. Introduction

Finnish working life has changed a lot during the last few decades causing increased mental work load to workers at workplaces. So it has become important to study the causes of work stress and the conditions on which work stress can be reduced and workers' mental well-being can be increased in the context of organisational development.

Among the central research problems in the study was to evaluate the reliability and validity of the JDS and EZ methods as the measures of job characteristics and mental well-being (Figure 1) in relation to underlying theories. The methods used were selected in the study, because they on the basis of literature were known to be fairly reliable and valid measures of perceived job characteristics (JDS) and short term mental work load (EZ). Without testing the reliability and validity of the methods in the data it would not have been possible to continue the research project.

The aim was also to study how organisations can improve their working conditions themselves and whether general law-type interrelationships can be found between the perception of organisational functioning, job characteristics and mental well-being. The role of individual factors in perceptive process was also studied.

The research model (figure 1) describes the research procedures carried out both on the basis of questions arisen during the procedure and the literature in the area.

JDS: Measuring Job Characteristics

The characteristics of the Job Diagnostic Survey (JDS) have been studied since the development of the method in the 1970s (Hackman & Oldham, 1974, 1975). The method is based on the Job Characteristics Model (JCM), according to which work can be examined by the five core job characteristics: Skill Variety, Task Identity, Task Significance, Autonomy and Feedback From Job.

The JDS consists of 19 dimensions altogether (figure 2). The basic hypothesis in the model is that the core job characteristics cause so called critical states in a worker like the sense of responsibility for work and perceiving a job meaningful. These cause job

satisfaction, high inner work motivation, "growth" satisfaction and good job performance. The developers supposed that job characteristics could be evaluated reliably by the JDS. They also assumed that by improving job characteristics, productivity and well-being of the personnel could be increased.

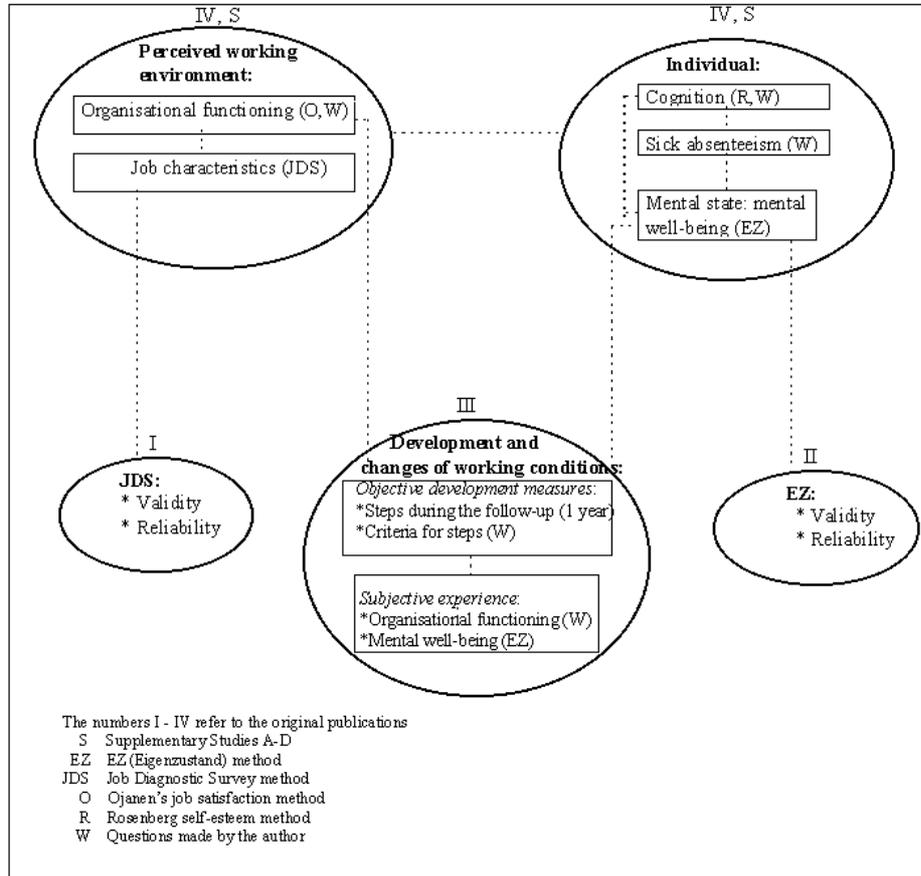


Figure 1: The research model. The relationships between perceived organisational and individual factors and self-conducted organisational development.

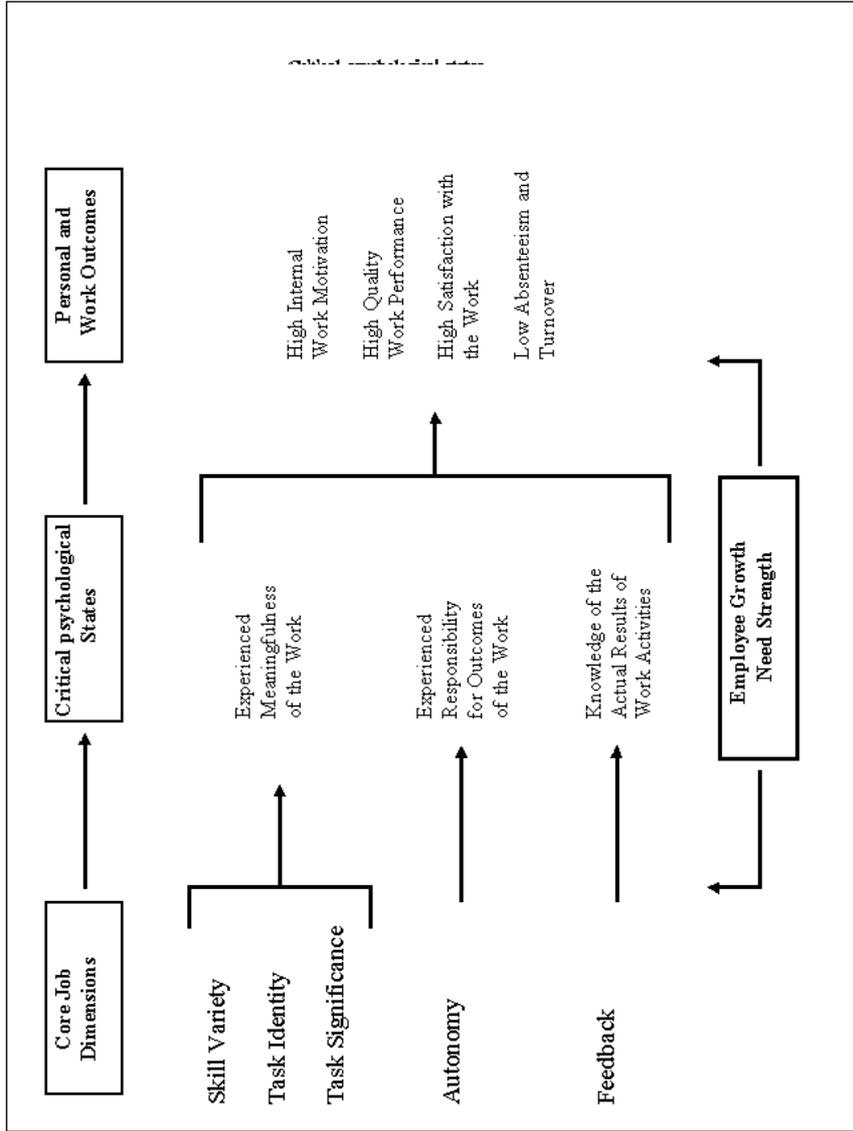


Figure 2. The Job Characteristics Model (Hackman & Oldham, 1974; Renn & Vandenberg, 1995)

Since its development, but especially in the 1980s, the method has been a target of criticism. The studies have been directed to clarify the reliability of the theoretical model (JCM), measuring and the scales as well as to evaluate the construct validity of the method.

As for the theoretical basis, it has been doubted (Fried & Ferris, 1987; Zaccaro & Store, 1988) that significant job characteristics could be summed up to the five main factors proposed by the authors (Hackman & Lawler, 1971; Hackman & Oldham, 1974, 1975).

Criticism has also been directed toward assumptions about the objectivity of the method; that the influence of job characteristics could be measured reliably by the JDS (Taber & Taylor, 1990). The use of additional, objective methods based on observations has been proposed. On the other hand, many results seem to confirm that the job characteristics measured by the JDS are connected with objective job characteristics (Algera, 1990; Gehardt, 1988; Taber & Taylor, 1990).

The reliable evaluation of job characteristics is difficult because of the fact that it is usually one and the same person who perceives both job characteristics and the other people's behaviour and attitudes. There is a danger of the covariance of dependent and independent variables, a kind of methodological bias (Algera, 1990).

Hypotheses have also been presented about the influence of contextual factors on the perception of job characteristics (Fried & Ferris, 1987). The Social Information Processing Model (SIP) has been presented as a supplementary or even contradictory theoretical basis. According to it the perception of job characteristics is influenced - in addition to objective job characteristics - by individual (emotional and cognitive) differences and social comparison. In this case the measured job characteristics are considered to be dependent variables (Fried & Ferris, 1987; Levin & Stokes, 1989; Taber & Taylor, 1990). According to some studies (Spangler, 1989), there is little evidence of the influence of personal factors on the perception of job characteristics.

Algera (1990) considers the relationship between objective and perceptive job characteristics evident but the author also emphasises the importance of social factors in perceiving job characteristics. Especially he criticises the rigidity of the Job Characteristics Model (JCM). He proposes that in addition to job characteristics attention should be paid to organisational factors, too. Algera presents (1990) that also the time dimension should be taken into consideration; according to some results, social factors are significant when a worker gets information before coming into contact with the work itself.

In the light of the previous discussion it seems that the five core job characteristics are not sufficient to describe job characteristics; a broader point of view is needed to evaluate job characteristics (Algera, 1990; Fried & Ferris, 1987; Levin & Stokes, 1989; Taber & Taylor, 1990).

The studies concerning the structure of the method have mainly been cross-sectional. The results have been very contradictory; the number of the factors has varied

from two to six (Brannon et al., 1988; Cordery & Sevastos, 1993; Idaszak et al., 1988; Khandelwal & Aleem, 1990; Taber & Taylor, 1990). The exploratory factor analysis has been used in most studies applying the method of maximum likelihood (varimax).

The confirmatory factor analysis has been used in some cases, for example for clarifying the expected factor structure. It has been noticed that especially items presented in a negative form are loaded on the same factor. One explanation might be a kind of measuring bias due to the structure of the measure (Taber & Taylor, 1990). As a result of the finding, a version of the JDS has been created in which negative items have been transformed into a positive form. Some results by the improved version have supported its use. (Cordery & Sevastos, 1993). On the other hand, results have also been presented according to which the usability of the improved version is not essentially better (Kulik & Oldham, 1988).

International studies on the reliability and validity of the method have mostly been directed towards clarifying the consistency of the factors. In general, the problem seems to concern low consistency rather than the separation ability of the scales (Taber & Taylor, 1990).

In the Finnish data (Vartiainen, 1990) it was noticed that job characteristics correlated with each other moderately; the items were loaded on the expected factors. Two versions of the JDS were used as methods. The explanation power of the factors was moderate: 67.7% (the newer version) and 67.5% (the older one).

The aim of this study was to clarify the reliability and validity of the JDS especially in a longitudinal data. The problem was to find out how reliable the factor structure of the JDS is (construct validity), and how reliable the measurements and the scales are. More information on the stability of the structure of the method was desired because of scanty available knowledge (Algera, 1990; Taber & Taylor, 1990). One of the targets was also to get more information about the validity of the structure of the JCM. Additional information was thought to be obtained by studying interrelationships between job characteristics, the Work Motivation Potential (WMP) and general perceptions caused by work.

One of the aims was also to compare the reliability and validity of the two Finnish versions of the JDS. It was hypothesised that the JDS would be a reliable method also in the Finnish data. Confirming results as to the reliability of the method would be valuable in general, because the data consisted of organisations independent of each other, and the methods used were methodologically strict.

EZ: Measuring Short-Term Mental Work Load

Mental work load has been classified into two main groups: long-term and short-term work load. The studies around the topic have been concentrated on clarifying the long-

term effects of work load, while less attention has been paid to short-term work load (Järvenpää, 1991; Kalimo, 1987; Niemelä & Teikari, 1984).

There is a general assumption about the influence of many factors on a person's mental well-being in a working environment (Cooper & Payne, 1978; Järvenpää, 1991; Kalimo, 1987; Karasek & Theorell, 1990; Niemelä & Teikari, 1984). The concept of mental work load is used here for mental strain and stress (Lazarus, 1966; Selye, 1956, 1983).

According to Nitsch (1971, 1974), mental work load is defined as a change of the person's inner mental state, which is caused by exposure to loading factors. Mental work load can either be positive or negative from health aspect depending on the worker's capacity (abilities, knowledge and skills) to meet the demands of the work. If the demands of the work are in conflict with the worker's capacity - they either exceed or are below his or her capacity - the outcome is work load injurious to the worker's health. If the demands of the work and the person's performance are in congruence with each other, positive work load from health aspect is brought about (Kalimo, 1987; Karasek & Theorell, 1990; Nitsch, 1971).

Work load is also regulated by possibilities of influencing the work performance. According to Karasek (Karasek & Theorell, 1990), the most loading work situations are those in which the possibilities of influence are poor and the demands of work are high. One factor which has been thought to be in connection with mental work load is Antonovsky's (1987) concept of the *Sense of Coherence*. By this he means the worker's perception that things are in order, in control and meaningful. Also Fisher (1984) emphasises the meaning of one's perception of control in coping with stress. A working situation is perceived as injurious from health aspect when it is - according to some authors - influenced by the perception of threat or the fear of loss as well as by lowered self-esteem and social support (Antonovsky, 1987; Cooper & Davidson, 1987; Kalimo, 1987; Saari & Majander, 1985).

The symptoms of short-term mental work load are shown in various emotional reactions during or immediately after the work day. A worker recovers, however, from them during normal pauses or relatively soon after the work day. Injurious mental work load is perceived as mental tiredness, monotony, frustration, irritability, low motivation to work and low work ability as well as changes in work performance (Hahn, 1986; Hacker & Richter, 1980; Kalimo, 1985, 1987; Kaufman et al., 1982; Kostama et al., 1992; Niemelä & Teikari, 1984). The perceptions of positive mental work load are, among other things, the feelings of achievement, the pleasure of an accomplished task, and the sense of being able to use one's knowledge and skills (Järvenpää, 1991; Kostama et al., 1992; Niemelä & Teikari, 1984).

Questionnaire techniques for measuring short-term mental work load have been developed. One of them is the EZ (Eigenzustand) scale developed by Nitsch (1971, 1974, 1976) in the German language area. He made norms for the principal dimensions

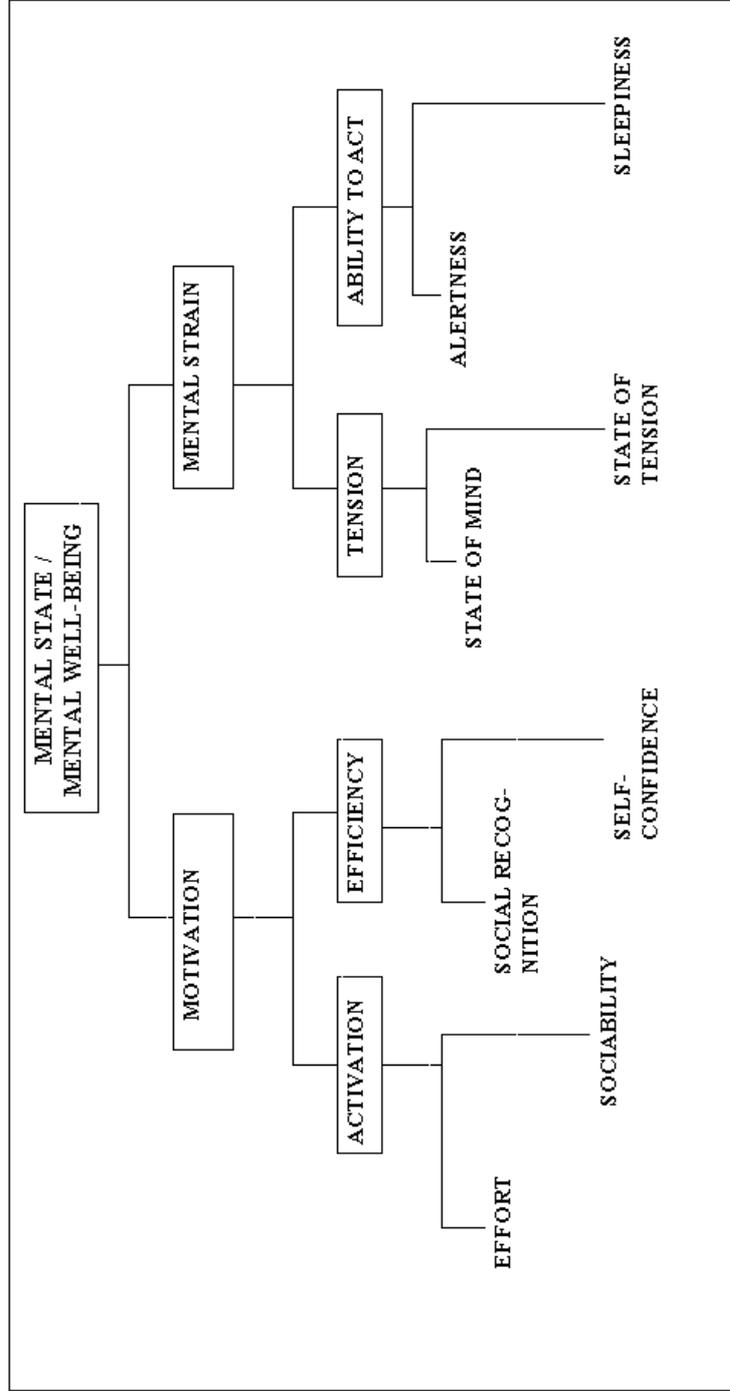


Figure 3. The hierarchical factor structure of the EZ (Järvenpää, 1991; Nitsch, 1974)

of the method by the so called Bistran analysis in the data of students. In the Bistran analysis the variables are repeatedly divided into two groups by the factor analysis (figure 3).

The method has been studied by the exploratory factor analysis for clarifying its structural reliability (contract validity). In some studies the expected factor structure has not been found; in some others the structure has been found partly (Apenburg, 1986; Apenburg & Häcker, 1984). Especially the highest levels of the hierarchy have been shown to be the most reliable (e.g. Kostama et al., 1992). A newer German version with 36 items has been proved to be more reliable than the original one in some studies made in the 1980s (Apenburg, 1986; Apenburg & Häcker, 1984). Some studies have also tried to show the criterion validity of the method (Kostama et al., 1992). So far the results have supported the method.

The validity of the method has been criticised. Apenburg (1986) proposed that work load would also be caused by other factors than work itself. It has been proposed that evaluations before the beginning of the work day are influenced by the person's mental state and his or her expectations about the coming work day. On the other hand, measurements after the work day are, among other things, influenced by expectations about the activities after the work day. Also the person's perception of his or her own state has been suspected to influence the perception of work load. It has also been criticised whether work load can be differentiated from other kind of load (Apenburg, 1986; Kostama et al., 1992). The reliability of the scales has generally been high, especially in the Finnish data (Apenburg, 1986; Järvenpää, 1991; Kostama et al., 1992).

The aim of the study was to clarify the structural validity and the reliability of the method. It was of special interest to find out the stability of the structure in repeated measurements. It was hypothesised on the basis of previous studies that the results of measurements would be fairly constant. Especially the results of the Finnish studies gave support to this assumption (Järvenpää, 1991; Kostama et al., 1992). It was interesting to see whether the expected theoretical structure at least of the two highest levels of the hierarchy would be discovered (e.g. Nitsch, 1971, 1974).

The hypothesis was that the method is reliable as to the factor structure and to the scales. Positive findings on a general level would be important using the data of independent organisations. In this connection the unique use of the confirmatory factor analysis would be of special value. The positive results would legitimate the use of the Finnish version with 39 items.

Organisational Self-Improvement

The renewal of the Labour Protection Act, which came into force in Finland on September 1988, provides mental health aspects to be taken into consideration in the evaluation

and follow-up of working conditions and in the planning of work premises (Työturvallisuuslaki, 1994), which is a continuous process. The comprehensive definition of health by the World Health Organisation (WHO) is emphasised in the report of the Committee for Social Affairs (Sosiaalivaliokunnan mietintö, 1986) in connection with the approval of the Labour Protection Act.

According to the WHO (1986), health consists of a person's physical, mental and social well-being. The consideration of factors protecting mental health is also stressed in the report. According to the interpretation of the Labour Protection Act, health includes, among other things, social atmosphere and organisational functioning (Työturvallisuuslaki, 1994). Organisational renewal is mentioned as an example of good health care practices in the legislation of occupational health care (Valtioneuvoston päätös, 1994).

In Finnish literature (Lindström, 1994a), the concept of organisation means many different things from group phenomena to the comprehensive examination of working conditions. The study of organisations can - if so desired - be limited to consider special parts of an organisation, like aspects of health. The signs of a healthy organisation have been considered: the central status of the personnel, the distribution of information, self-development and the share of tasks and equality (e.g. Beekhard, 1969). Workers' perception of the possibilities of social support improves both the health of an organisation and an individual (Vahtera, 1993).

A healthy organisation is characterised by functioning which is based on the social relationships between the members of the organisation, and on social support (Kaukanen, 1995; Lindström, 1995). Leadership is of crucial importance as for organisational functioning. There are also supportive structures like occupational safety and health and occupational health care in an organisation that improves the workers' health and the functioning of the organisation (Weisboard, 1978).

The Finnish occupational safety and health has mostly been considered to include the protection of health, which has traditionally been directed to attending to or preventing ergonomic deficiencies or those of work safety (Dean & Hancock, 1992; Kalimo, 1994). Recently, attempts have been made to develop the labour inspectors' work from the perspective of production control (Engeström, 1987, 1995; Virkkunen, 1995). The organisational isolation of occupational safety and health from line supervision has been considered as a problem causing inefficiency in the functioning of the organisation (Eklund & Suikkanen, 1982).

Labour inspectors often meet organisations in crisis, but their means for influencing organisational development are fairly restricted. In addition to the lack of sufficient expert knowledge, their problem is the lack of time needed for proper activity (Hämäläinen & Suurnäkki, 1995; Kaukanen, 1995). It is central for labour inspectors' control of work that an organisational development process can be started and supported taking into consideration the organisations' own resources at the same time. In the case

of success, organisations could by self-improvement take advantage of their mental and material resources at fairly low expenses.

The first step in a development process can be taken by the top management of the organisation, a single worker, a consult, or the bodies of the organisation (Lindström, 1994b). According to some opinions, a single worker's role, and especially that of the manager, is central in the beginning and in carrying out the process (Argyris, 1985); some others emphasise the meaning of activity from down to up (e.g. Murto, 1992).

The need for using an outside expert has been evaluated in connection with organisational development (Cummings & Mohrman, 1987; Leoford & Mohrman, 1993; Wilson, 1994). According to Wilson (1994), it has to be evaluated whether an organisation is able to manage a development process by itself, and when an expert's help is needed. Every now and then an expert is used as an outside observer for evaluating an organisation and facilitating its development. Then the advantage is certain objectivity. At times the importance of an expert's participation in the development process itself is emphasised; its advantage is the availability of sufficient knowledge, though it may be subjective (Lindström, 1994b; Saarela, 1991).

In her studies on work safety Saarela has (1991) stressed the importance of self-conducted small groups in the development process. In this connection she has also stressed the importance of giving development tools for organisations.

Cummings & Mohrman (1987) and Leoford & Mohrman (1993) have recently carried out studies the aim of which has been to clarify the possibility of self-conducted organisational development even without an outside expert. For supporting the development of working conditions, an organisation has generally been expected to use some kind of project group the activity of which has been considered as important for a successful development process (Heikkinen, 1990; Leoford & Mohrman, 1993).

According to Lindström (1994c), evaluations about the real changes in organisations or the results and the meaning of development processes have not usually been made or evaluation has been insufficient.

The role of planning has been considered in connection with a development process. Smith et al. (1990) have noticed in their studies that good designing leads to good results in a short time, while the targets cannot be achieved by poor-quality planning even in a long run, rather on the contrary. In this study the concept of organisational functioning is defined to include :

willingness of the members of an organisation to develop their working conditions, co-operation between supervisors and sub-ordinates, collaboration between the workers, functioning of occupational safety and health staff and occupational health care, and the possibility of participation.

The purpose of defining functioning in this way was to emphasise the characteristics of a healthy organisation. A precondition of perceived functioning is that the struc-

tural characteristics of an organisation, like task clarity and the division of work, are all right. A well functioning organisation is also productive.

An aim was to clarify how organisations - in this case the development organisations - can improve their working conditions by themselves, and whether this is connected with mental work load perceived by workers. The expectation was that an organisation is able to develop its working conditions without outside expertise. It was not quite clear on which conditions this could happen. It was, however, supposed that leadership and participation would be important factors to be taken into consideration.

It was also very interesting to see in general how an organisation would succeed in its development process with the contributory factor of feedback from perceived organisational functioning. Positive results would confirm Cummings & Mohrman's (1987) and Leoford & Mohrman's (1993) proposals. The results were also expected to tell about the suitability of the method as for the resources of personnel. An interesting thing would also be to compare the method with the well-known method of learning by expanding (Engeström, 1987, 1995).

The Role of Organisational Functioning and the Characteristics of Work in Perceiving Mental Work Load

Personnel which have got enough strength to work, which are co-operative and interested in developing their work and working conditions are an essential precondition of work of good quality and productivity. A healthy organisation is characterised by functioning (e.g. Lindström, 1994a). The signs of functioning are participatory management style, good co-operation and sufficient possibilities of participation. Functioning will also be improved if supportive structures like occupational safety and health and occupational health care have been arranged and they function properly (Weisboard, 1978).

Job characteristics have been thought to influence the workers' mental strain and work motivation as well as sick days and through them the production, too (e.g. Hackman & Oldham, 1974). The developers (Turner & Lawrence, 1965) of the Job Characteristics Model (JCM) proposed that the real characteristics of work are in connection with sick days and psychosomatic symptoms. Hackman & Oldham (1974, 1975) considered such important job characteristics like sufficient Autonomy, the perception of one's own tasks in an integrated whole (Task Identity), the diversified use of skills (Skill Variety), social meaningfulness (Task Significance) and Feedback From Job.

Cognition has been supposed to regulate perceived mental state and behaviour (Hacker, 1982; Kivimäki, 1996; Lazarus, 1966). Neisser (1982) defines cognition as a 'function of knowledge'. By this he means acquiring, organising and using knowledge. The perception and evaluation of functioning on the basis of feed-back are included (e.g. Bandura, 1991) in cognitive functions.

There are different definitions of the concept of self-esteem (e.g. Bandura, 1988; Kauppinen-Toropainen, 1987; Rosenberg, 1979). In this study the Finnish equivalent "itsearvostus" of the concept of self-esteem was used. The concept is defined in greater detail in the following.

Fletcher et al. (1992) considered the study of work-related self-esteem as problematic, because a worker reacts to many factors at a workplace. Self-esteem has been defined (Coopersmith, 1967) as a person's belief of him- or herself as a meaningful, successful and valuable person. Rosenberg (1979) has defined self-esteem as a person's either positive or negative attitude to him- or herself. The concept is verified in practice in the items of the self-esteem scale made by him. The items include presumptions which concern a person's concept of his or her own value and ability to manage in every-day life situations in relation to other people. In this study self-esteem was measured by the Rosenberg self-esteem scale.

Self-efficacy is a concept used by Bandura (1988). By this he means a person's belief of his or her capacity of being able to be motivated and to take advantage of his or her cognitive resources and functions that are needed for life-control in difficult circumstances. It is evident that the different definitions of self-esteem are mainly theoretical by their nature; different researchers speak about a fairly similar kind of phenomenon using their own theoretical frameworks and conceptual system.

Bandura presents (Bandura, 1991; Bandura & Jourden, 1991) - using the framework of social cognition theory - that a person's self-regulatory mechanisms influence his or her behaviour through self-monitoring. He assumes that self-monitoring has an impact on perceived self-efficacy due to one's functions. This in turn - according to him - influences a person's thoughts, emotions, motivation and functions.

According to a generally shared opinion (e.g. Epstein, 1983; Locke, 1976; Saari & Majander, 1985; Thompson, 1971; Tice & Baumeister, 1990), a person's self-esteem influences the perception of stress or mental strain. On the other hand, it has also been presented that mental strain has an impact on self-esteem (French & Caplan, 1972; Kauppinen-Toropainen, 1987).

In Finland studies have also been made recently the aim of which has been to clarify the relationship of self-esteem with stress, well-being and health (Kalimo & Toppinen, 1993; Kivimäki & Kalimo, 1996). On the basis of these studies, hypotheses (Kivimäki & Kalimo, 1996) have been made for example of mutual influence: mental strain influences self-esteem, but also vice versa. Kivimäki (1996) has also proposed that heavy stress may decrease self-esteem.

Short-term (emotional) mental work load (motivation, mental strain) has been studied by the EZ method developed by Nitsch (1971, 1976). The interrelationships between mental state (measured in this way) and the core characteristics of work by Hackman & Oldham (1974, 1975) have not - as far as is known - been studied before

(Järvenpää, 1991). Neither has the concept of 'mental state' proposed by Nitsch (1971, 1976) presumably been confirmed later.

In this study the target was to clarify the interrelationships of perceived working environment (organisational functioning and job characteristics), a worker's cognitions (self-esteem and willingness to develop working conditions) and mental state (motivation, mental strain). The mutual interrelationships of these factors were studied, too. One target was also to find out the relationships of the factors in connection with sick days as well as the change of sick days during the follow-up period of one year. The interrelationships between gender, age and education and the variables mentioned were also studied.

It was supposed that both job characteristics and organisational functioning influence a worker's mental well-being. It was expected that the items of job characteristics and mental well-being would be loaded on different factors; presumably the items of the JDS would stand for the structural characteristics of working environment.

It was also hypothesised that the items of the EZ would form a single factor of *mental state* according to the underlying theory. On the basis of the theoretical background it was supposed that job characteristics, including the perception of control would, influence the perception of mental strain.

It was also expected that mental strain would have an impact on self-esteem. The positive findings with the data of independent organisations would bring new knowledge about the interrelationships of organisational and individual factors on a general level and help the developers and designers of workplaces to redesign workplaces.

The Role of Individual Factors in the Perception of Working Environment

Job Characteristics

The JCM model developed by Turner & Lawrence (1965) was constructed on the assumptions that environmental factors like the objective characteristics of job and leadership influence a worker's motivation and job satisfaction via individual factors. The influence was mainly expected to be one-way. Also some other authors have presented the same kind of propositions (Munn et al., 1996; Ting, 1997). The role of self-esteem has been considered as important in many studies (see the previous discussion).

There has been little evidence of the influence of cognitive factors on the perception of job characteristics. For example, there is little knowledge about interrelationships between the perception of control and the perception of job characteristics.

Antonovsky (e.g. 1979, 1987) used the concept of the *Sense of Coherence* referring to 1) the sense which the internal and external environment make to someone and which is predictable (comprehensibility), 2) the sense of control (manageability) and 3)

meaningfulness. Huhtaniemi (1995) used the concept of *the sense of life-control* by which she meant a human resource against stress and a means for achieving a goal.

Karasek (e.g. Karasek, 1979; Karasek & Theorell, 1990) used the concept of *job demands and control* described by the Demand/Control Model (DCM) when speaking about a worker's possibility to influence his or her job performance. Kobasa (1979) used the concept of *hardiness* for the generalised feeling of control. Leppänen (1993) proposed that the *perception of competence* in the development of work protected a worker better from long-term stress effects than the conceptual mastering of the work.

In this study the variables of self-esteem and willingness to develop working conditions were considered as cognitive factors. The target was to find out whether cognitive factors are related to the perception of job characteristics and whether possible interrelationships could be shown despite of the influence of a special organisation or a single individual. This was interesting because - on one hand - arguments about the objective nature of job characteristics have been made; on the other hand, arguments about the influence of contextual and individual variables have been presented (see the previous discussion page 18.) It was expected that cognitive factors might not possibly influence a worker's perception of the characteristics of work - not at least on a general level.

Organisational Functioning

Functioning has been considered as a sign of a healthy organisation (e.g. Lindström, 1995). Functioning has been thought to be based on social relationships and social support (Lindström, 1995; Kaukanen, 1995).

The role of social support in a stress process has been considered as important in many studies (e.g. House, 1981; Karasek & Theorell, 1990). It has been argued that the possibility of social support decreases mental strain (e.g. Kalimo, 1980, Karasek & Theorell, 1990). Some authors (e.g. Deci & Ryan, 1991) have argued that social support is based on interrelationships between individuals; therefore the possibility of receiving support depends on the receiver's personality, especially on personal coherence.

It has also been argued (e.g. Cohen & Wills, 1985; Dooley et al., 1987) that social integration and satisfying social relationships are interrelated. In this connection the possibility of social support (e.g. Munn et al., 1996) and participation (e.g. Israel et al., 1989; Parker et al., 1997) has been considered likely.

It has been shown that self-esteem (Kauppinen-Toropainen, 1987) is connected with job satisfaction. Nowack (1991) argued that *cognitive hardiness* (a kind of equivalent of self-esteem) influences a person's job satisfaction.

The previous discussion gave an idea to study more closely interrelationships between organisational functioning, job satisfaction and mental work load. It was of special interest to examine whether job satisfaction functions as a mediator between or-

organisational functioning and perceived mental state. It was also interesting to study how the factors of organisational functioning (see the previous description) are related with job satisfaction and what the role of each of them is in the process. It was expected that at least co-operation between supervisors and sub-ordinates and co-operation between the workers as well as participation would have interrelationships with job satisfaction.

One of the targets of the study was also to clarify the interrelationships of job satisfaction with a worker's cognitive factors like self-esteem and willingness to develop working conditions. On the basis of literature (e.g. Kauppinen-Toropainen, 1987), it was expected that self-esteem would influence job satisfaction. Possible findings by the data of a general level would be of interest from a theoretical point of view.

The purpose was also to clarify whether cognitive factors (like self-esteem) would influence the perception of organisational functioning. It was supposed that (according to Deci & Ryan, 1991) this would be possible. It was considered interesting to clarify whether the expectation would come true, even if any special individual or contextual factors could not be found.

Cognitions and Emotions

The role of the perception of control in coping with stress has been emphasised in many studies (e.g. Antonovsky, 1987; Fisher, 1984; Karasek & Theorell, 1990). The sense of control has also been seen as important in reducing one's arousal level (Sterling & Allostasis, 1988). Interrelationships between the perception of control and self-esteem have also been found (e.g. Järvikoski, 1994; Kauppinen-Toropainen, 1987).

Self-esteem has been proposed to be an important factor in regulating work stress (Epstein, 1983; French & Caplan, 1972; Kivimäki & Kalimo, 1996). Bandura (1991) argued that self-efficacy (an equivalent of self-esteem) influences a person's behaviour on four main levels: cognition, affection, motivation and functioning. He argued (1992) that self-efficacy does not influence reactively one's emotional reactions.

In this study mental state (motivation, mental strain) was expected to represent a person's emotional state; self-esteem and willingness to develop working conditions were assumed to be cognitive factors. It was interesting to clarify in which way these factors were linked with each other; whether the variables were loaded on the same or on different factors. It was supposed that the variables were possibly loaded on different factors, because they represented such different personal functions. A special meaning to the findings from the aspect of generalisation was given by the fact that the data consisted of separate organisations.

Perceived Working Environment and Worker's Health

The developers of the JDS (Turner & Lawrence, 1965) hypothesised (see the previous discussion) that environmental factors like job characteristics influence a person's health. The critics of the theory (e.g. Fried & Ferris, 1987) have presented - according to the theory of Social Information Processing (SIP) - that there are contextual factors such as social cues, which influence the interpretation of job characteristics. Also the role of individual factors has been considered (Levin & Stokes, 1989; Schaubroeck et al., 1996).

One target of the study was to try to verify the original assumptions of the developers. An opportunity to this was offered by using data from which the effect of special contextual and individual factors could be eliminated. It was hypothesised that work characteristics influence one's health independent of the factors mentioned. In the case of discovery of the expected interrelationships the meaning of job characteristics to a worker's health could be evaluated in a new light.

Interrelationship between social integration (and social support) and health effects has been found in many studies (e.g. Cohen & Wills, 1985; House, 1981; Kalimo, 1980; Karasek et al., 1982; Karasek & Theorell, 1990; Vahtera, 1993). Assumptions of the influence of different kind of social support on work stress have been made (Karasek et al., 1982).

The aim of this study was to clarify interrelationships between organisational functioning (see the previous discussion) and a worker's health indicated by sick days. In this study interrelationships were studied in data based on the averages of given evaluations.

Many authors (e.g. Bednar et al., 1989; Rosenberg, 1962) have presented that self-esteem is closely related to psychological difficulties. Kalimo & Toppinen (1993) found that experienced health status was best explained by self-esteem. Bandura (e.g. 1986, 1996) assumed that self-efficacy was a central factor regulating human behaviour. Saari & Majander (1985) were also convinced of the central regulative role of self-esteem in human behaviour and presented that low self-esteem was connected with high stress experience. Assumptions have also been made about the regulatory role of stress level in the perception of stress (e.g. Karasek et al., 1982).

One of the targets in this study was to clarify interrelationships between the individual factors of mental state (motivation, mental strain), self-esteem and a person's health measured by sick days. The presumption was that self-esteem would be connected with a person's health indicated by sick days. The possible findings would support the earlier assumptions about the role of self-esteem in a worker's health. The result could, possibly, also be used for interpreting the mechanism of the influence of the working environment on personal health on a general level.

Problems

On the basis of previous discussion the following main questions posed were:

- 1) Is the Job Diagnostic Survey a valid and reliable method for measuring structural job characteristics? (page 3)
- 2) Is the EZ method a valid and reliable measure for assessing the mental work load caused by the structural job characteristics (page 7)
- 3) How can organisations develop their working conditions by themselves without outside expertise? (page 10)
- 4) What kind of relationships can be found between work environmental and individual factors which are independent of an individual's perception and the impact of the organisation, and how do these work? (page 13)
- 5) What kind of interrelationships between the working environment, individual factors and health can be found? (page 18)

2. Methods

Target Organisations

The aim of the study was to find out whether the Finnish versions of the JDS and the EZ are reliable methods for measuring the impact of the core characteristics of work on mental well-being. One of the most interesting questions was to study how an organisation can develop its working conditions without outside expertise. It was also clarified how organisational functioning and job characteristics influence mental well-being and what the role of individual factors is in perceiving the working environment. (figure 1).

The target organisations consisted of 15 workplaces in the public sector. Three main groups were formed of them: the development group (seven organisations), the comparison group one (five organisations) and the comparison group two (three organisations), table 1.

Table 1. Target organisations: the workers' total number and the number of the respondents

Material / Measurement	Development group: 7 organisations			Comparison group 1: 5 organisations			Comparison group 2: 3 organisations			All the groups: 15 organisations		
	N	n	%	N	n	%	N	n	%	N	n	%
The whole data												
1	215	131	60.9	162	123	75.9	129	72	55.8	506	326	64.4
2	211	93	44.1	156	91	58.3	-	-	-	367	184	50.1
3	183	93	50.8	142	72	50.7	135	80	59.3	460	245	53.3
Sum	609	317	52.1	460	286	62.2	264	152	57.6	1333	755	56.6
The longitudinal data	n	l	p	n	l	p	n	l	p	n	l	p
1	131	55	42.0	123	56	45.5	72	48	66.7	326	159	48.8
2	93	55	59.1	91	56	61.5	-	-	-	184	111	60.3
3	93	55	59.1	72	56	77.8	80	48	60.0	245	159	64.9
Sum	317	165	52.1	286	168	58.7	152	96	63.2	755	429	56.8

N The workers' total number in the data

n The respondents in the whole data

% Return per cent

l Observations that could be followed from measure to measure

p Proportion of the followed observations of the respondents

Table 2. The procedures; the overview. (For the explanation of the symbols, please, see the description below)

Material s/Groups/ Organisations	Measurements/Targets/Methods			2			3		
	1 Reliability J E J E W O R J E W O R S	Factor structure J E W O R J E W O R S	Effects J E W O R S J E W O R S	Differe. J E W O R S J E W O R S	Reliability J E W O R S J E W O R S	Factor struct. J E W O R S J E W O R S	Reliab. J E W O R S J E W O R S	Factor struct. J E W O R S J E W O R S	Changes, E W O A S E W O A S
<i>Cross-sectional data</i>									
Development group (A), K1-K7	α, α^1 α^2	e e e e k k k	l l l l o o o o o o	χ^2 v v	α, α^1 α^2		α, α^1 α^2		
(K1-K3): Compar. group I (B), V1-V5:	α, α^1 α^2		g, g, g	v v	α, α^1 α^2		α, α^1 α^2		
(A+B): Compar. group II (C), V6-V8:	R^2 R^2 α, α^1 α^2	e k		χ^2 v v	R^2 R^2 α, α^1 α^2	k	R^2 R^2 α, α^1 α^2	k	
(A+B+C): <i>Longitudinal data</i>		k^1 k^2 e		v	k^1 k^2		k^1 k^2		
Development group (A), K1-K7:	α, α^1 tt α^2				α, α^1 tt α^2		α, α^1 tt α^2		
(K1-K3): Compar. group I (B), V1-V5:	α, α^1 tt α^2				α, α^1 tt α^2		α, α^1 tt α^2		
(A+B): Compar. group II (C), V6-V8:	R^2 α, α^1 α^2	k^1 k^1			R^2 α, α^1 α^2	k^1 k^1	R^2 α, α^1 α^2	k^1 k^1	

J = the core characteristics of work (JDS); E = mental well-being (motivation, mental strain); EZ, W = organisational functioning, the items by the author; O = job satisfaction (by M. Cjzen method); R = self-esteem (Rosenberg's self-esteem method); a = the ability to act (EZ); s = sick absenteeism (the item by the author); h = differences as to back ground variables; j = differences between the target groups as to the job characteristics (JDS); M = mental strain (EZ); differences between the partial groups ("little" < mean, "much" > mean) of organisational functioning, the job characteristics and individual factors; S = sick absenteeism, differences between the partial groups ("little" < mean, "much" > mean) of organisational functioning, the job characteristics and individual factors; α = Cronbach's alpha coefficient, α^1 = Cronbach's alpha (EZ, morning measure), α^2 = Cronbach's alpha (EZ, evening measure); e = exploratory factor analysis; k = confirmatory factor analysis; l = path analysis of latent variables (factors); o = path analysis of observed variables; g = regression analysis; t = t-tests; χ^2 = Chi square-test; v = one-way analysis of variance; R^2 = squared multiple correlation; R^2 = squared multiple correlation, morning and evening measures; k^1 = confirmatory factor analysis (EZ, morning measure); k^2 = confirmatory factor analysis (EZ, evening measure); tt = correlation of the factor items of the repeated measures; m = multiple analysis of variance of repeated measures with t-test of dependent observations.

The composition and the size of the groups varied somewhat according to the research problems (table 2).

The development (K1-K7) and the comparison group one (V1-V5) consisted of regional workplaces of Posts and Telecommunications of Finland and the workplaces of Occupational Safety and Health Administration. The comparison group two (V6-V8) was formed by the regional workplaces of the Occupational Safety and Health Administration. The material consisted of both cross-sectional and longitudinal data.

The Main Statistical Methods

The consistency of the scales (α)¹ of the JDS (e.g. Hackman & Lawler, 1971) and EZ (e.g. Nitsch, 1971) methods was studied in all the groups and in all the measurements (table 1 and table 2). The reliability of the EZ scales was studied both in the morning (α^1) and in the evening measurements (α^2). The factor structure of the JDS method was studied by exploratory factor analysis (e) in the two groups of organisations, which consisted 1) of the development group (K1-K7) and the comparison group one (V1-V5), and 2) the comparison group two (V6-V8). The study was carried out using the cross-sectional data of the first measurement. The factor structure of the JDS method was examined by confirmatory factor analysis (k) in the group of organisations which consisted of the development group one (K1-K7) and the comparison group one (V1-V5). The study was carried out by both cross-sectional and longitudinal data and in all three measurements.

The stability of the factor structure (rt) of the JDS was studied in the development group (K1-K7) and in the comparison group one (V1-V5) in all the three measurements by longitudinal data. The linear explanation power of the items (R^2) of the JDS was studied in the group of organisations of the development group (K1-K7) and the comparison group one (V1-V5) by cross-sectional data in all the three measurements.

The factor structure of the EZ method on the two highest levels of hierarchy was studied by the confirmatory factor analysis (Lisrel) in the group of all the organisations: the development group (K1-K7), the comparison group one (V1-V5) and the comparison group two (V6-V8) based on cross-sectional data in all the three measurements. The analysis was made on the basis of both the data of the morning (k1) and the evening measurements (k2). By longitudinal data the factor structure of the method was studied in the group of organisations which consisted of the development group (K1-K7) and the comparison group one (V1-V5). The analyses were made on the basis of the morning measurements (k1) only, but in all the three measurements.

The linear explanation power (R^2) of the EZ method was studied in the group of the development group (K1-K7) and the comparison group one (V1-V5) by both cross-

¹ For the explanation of symbols, please, see table 2

sectional and longitudinal data. The material consisted of both the morning and the evening measurements.

The stability of the factor structure of the EZ method was studied by the test-retest correlation coefficients (rt) in the comparison group one (V1-V5) in the longitudinal data only.

The changes of job satisfaction (O) were studied by the multiple analysis of variance of repeated measures, MANOVA (m) both in the development (K1-K3) and the comparison group one (V1-V5) in all the three measurements in the longitudinal data. The changes in the ability to act (a) were studied in all the groups by the longitudinal data during the follow-up period; MANOVA was used as a method.

The changes of the organisational functioning (W) were studied by MANOVA (m) in the development group (K1-K3) in all the three measurements by the longitudinal data.

The changes of mental well-being (EZ; motivation, mental strain) were studied by MANOVA (m) in the development group (K1-K3), the comparison group one (V1-V5) and the comparison group two (V6-V8) by the longitudinal data. The changes were measured by three measurements in the development group and the comparison group one and by two measurements in the comparison group two.

In the development group (K1-K7) the interrelationships between the job characteristics (J), mental well-being (E), organisational functioning (W) and self-esteem (R) were studied by the exploratory (e) factor analysis in the cross-sectional data (first measurement). The found factor structure was confirmed by the confirmatory factor analysis (k) in the development group (K1-K7) in the cross-sectional data (first measurement).

The effects of the job characteristics (J) and the organisational functioning (W) on mental well-being (E) were studied by the path analysis of latent variables (l) in the development group (K1-K7) in the cross-sectional data (first measurement). The effects of the organisational functioning and the job characteristics on mental well-being and self-esteem were studied by the path analysis of observed variables (o) in the development group (K1-K7) in the cross-sectional data. This was also the case in studying the mediating role of job satisfaction between organisational functioning and mental state. The effects of the organisational functioning (W) on sick absenteeism (s) were studied by regression analysis (g) in the development group (K1-K3) in the cross-sectional data.

The changes of sick absenteeism (s) were studied by the t-tests (t) in the development (K1-K3) and the comparison group one (V1-V5) in the longitudinal data.

The differences as to background variables (b) were studied by the chi square tests (χ^2) in the development group (K1-K7) and in the group consisting of both the development (K1-K7) and the comparison group one (V1-V5) in the cross-sectional data. In the longitudinal data the corresponding differences were studied in the comparison group two (V6-V8).

The differences of the partial groups ("little" < mean; "much" > mean) of the independent variables (the organisational functioning, the job characteristics and the individual factors) were studied in relation to the dependent variables (mental strain, sick absenteeism) in the development (K1-K7), in the comparison group one (V1-V5) and in the group which included both the groups by the cross-sectional data. The method used was the one-way analysis of variance (v). The measurement was based on the data of the first measurement.

Measures

All the measures were included in the same material distributed to the respondents to be filled in. Except the first measurement of the comparison group two (V6-V8), the material was delivered by post.

In the first article (Study I, originally published 1994) *The reliability of the Job Diagnostic Survey (JDS) in evaluating the core traits of work* the reliability of the method was studied. The core characteristics of work were measured by the Finnish versions of the Job Diagnostic Survey (JDS) method (figure 2). The study was carried out by three measurements in the development group (K1-K7) and the comparison group one (V1-V5) during about one year. There were only two measurements in the comparison group two (V6-V8). The time between the measurements was about half a year, except for the comparison group two, in which the interval was about one year. This arrangement made it possible to examine the reliability of the factor structure and the scales in the different measurements.

The second article (Study II, originally published 1995) *The EZ (Eigenzustand) method as an assessment instrument of work load: Evaluating the validity and the reliability of the method* concerned the properties of the EZ method (figure 3). The mental well-being of the workers was measured by the Finnish version of the EZ (Eigenzustand) method with 39 items. This version of the method, as well as the one of the JDS, was constructed by the Laboratory of Work Psychology and Leadership at Helsinki University of Technology.

The respondents filled in the items both at the beginning and at the end of the work day. The measurements were made three times during one year both in the development (K1-K7) and in the comparison group one (V1-V5) and two times in the comparison group two (V6-V8); the intervals between the measurements in the different groups were the same as described above. By this arrangement it was possible to compare the results of the morning and the evening measurements with each other. It was also possible to study the factor structure of the method and its stability in the different measurements.

The third article (Study III, originally published 1996) *Organisational self-improvement and mental work load* dealt with the changes of the organisational functioning and mental well-being as well as the preconditions for the self-conducted organisational development. The organisational functioning was measured by the author's six items with six-classes: *co-operation between the supervisors and the subordinates, collaboration between the workers, functioning of occupational safety and health staff and occupational health care, participation and willingness to develop working conditions*. In addition there was room for the respondent's comments at the end of every item.

Mental work load (mental well-being) was measured by the EZ method. The measurements were made three times during the follow-up period in the development group of the seven organisations (K1-K7); however, the development of only three of the organisations (K1-K3) could be followed.

The arrangement made it possible to compare the changes of mental well-being (motivation, mental strain) and in this connection also the changes of the ability to act during the follow-up period. It was also possible to study the changes of job satisfaction and self-esteem. Job satisfaction was measured by M. Ojanen's question (Ojanen, 1988). The method with one item was constructed of the vertical line scaled from 1 to 100 with the spots of assessment at every 20th points. In connection with the spots there were instructions for the assessment. Self-esteem was evaluated by the Rosenberg self-esteem (sum)scale (Rosenberg, 1979) consisting of 10 four-class items, half of which were scaled in the opposite order.

The preconditions for self-conducted organisational development in the development organisations (K1-K3) were studied via the amount, the distribution and the content of the developmental acts during the follow-up time. The self-reports of the development groups were also evaluated. The data was collected by the author's questions.

The fourth article (Study IV, originally published 1997) *A well functioning organisation and properly demanding work increase motivation, decrease mental strain and improve self-esteem* concerned the effects between the organisational functioning, the core characteristics of work and mental well-being as well as the interrelationships between mental well-being and the other individual factors. The organisational functioning was measured by the author's questions, the core characteristics of job by the JDS method and mental well-being by the EZ method. The interrelationships between organisational functioning, the job characteristics and sick absenteeism were studied as well as the changes in sick absenteeism during the follow-up time (one year). Sick absenteeism was measured by the author's questions.

In addition to the articles mentioned above, some Supplementary Studies were carried out at the beginning of the year 1998 for answering some questions left open. The supplementary studies dealt with the interrelationships between the job characteristics, organisational functioning and individual factors as well as the interrelationships between the individual factors.

One target of the studies was to clarify how the individual factors and the perception of job characteristics were interrelated; whether the core characteristics of work and the individual factors (self-esteem, willingness to develop working conditions) formed a two-factor structure and whether they had impacts on each other. The study was carried out by the confirmatory factor analysis and path analysis by Lisrel. The core characteristics of work were measured by the JDS method, self-esteem by the Rosenberg self-esteem scale and the willingness to develop working conditions by the author's question.

Secondly, the impacts of the single items (self-esteem, willingness to develop working conditions, Skill Variety, Task Significance and Feedback From Job) of the possible two factors (described above) on each other were clarified. The study was carried out by the path analysis with observed variables (Lisrel).

The third study clarified the interrelationships between the organisational functioning, job satisfaction, the willingness to develop working conditions and mental strain. The study was carried out to answer the question whether there were intermediary factors between the organisational functioning and the perception of mental strain. Of special interest was the role of job satisfaction in this process. Job satisfaction was measured by M. Ojanen's (1988) method and mental strain by the EZ method (Kostama et al., 1992; Nitsch, 1971). The statistical method used was the path analysis with observed variables (Lisrel).

The aim of the fourth study was to clarify the interrelationships between the individual factors (motivation, mental strain, willingness to develop working conditions and self-esteem); whether the items were loaded on the same or different factors. The question was of interest, because the individual factors included both affective and cognitive elements of varying amounts. The method used was the confirmatory factor analysis by Lisrel.

Procedures

The data was collected staggered in three phases in 1989-1990, so that the interval between the first and the last measurement was about one year (table 3). In the development group (K1-K7) and in the comparison group one (V1-V5) there was also one measurement in the middle of the period so that the time between the measurements was about half a year. In the development (K1-K7) and the comparison group one (V1-V5) the material was collected by sending all the material by post to the respondents at the same time. In the comparison group two (V6-V8) the material of the first measurement was collected in the actual workplaces and the material of the second measurement by post. The respondents were allowed to send the questionnaires anonymously and directly to

Table 3. The time table of the measurements in development (K1-K7) and the comparison (V1-V8) organisations

Year/Group of measurements	Month/ Organisation											
	1	2	3	4	5	6	7	8	9	10	11	12
1989												
I	V8	V6, V7			K1, K4, V1, K5	K6			K2, V3		K4, V6, V1, K5	K6
II												
III										K3, K7, V5		
1990												
I	V8	V6, V7			K1, K4, V1, V2	K6						
II			K2, V3						K2, V3			
III			K3, K7, V5							K3, K7, V4, V5		

the researcher. Anonymity was considered to be important for the reliability of the replies. The number of the respondents (table 1) varied according to the procedures (table 2).

The preparations of the research project were made carefully. There were negotiations with the top management and the supervisors as well as with the elected officials of the workers. Information events were also arranged, where the whole personnel were informed about the project. In these occasions the personnel could ask the researcher (the author) about the interesting things concerning the project. Thus the acceptance of the workers was achieved, which was considered to be important for the successful implementation of the enterprise. In connection with the negotiations the researcher emphasised that the type of the development process could be freely chosen by the organisation. He also mentioned that it is usual, however, to establish a development group for the work. All the organisations established a development group. In this connection it was also agreed that one person in the organisation would be elected as a contact person between the organisation and the researcher. The role of the contact-person was, among other things, to receive and to give feedback about the development process of the organisation.

The task of the development organisations (K1-K7) was to try to develop their working conditions in their own way during the follow-up period (one year). The perception of the organisational functioning, the job characteristics and mental well-being was measured three times during one year. After each measurement (within two weeks) the researcher gave feedback to each one of the three development organisations (via the contact person) about the functioning of the organisation. The development groups of the organisations gave reports (via the contact person) to the researcher about the development functions by filling in a special questionnaire at the end of every month. At the end of the follow-up period the organisations (the development groups) gave their assessment about the suitability of the method for the organisational development in their organisation.

The verbal replies to the items of organisational functioning were scored according to a special classification. This was constructed by the principles of assessment based on the researcher's and the assisting person's evaluation of the responses; the agreement of over 90% of the independent evaluations was achieved. The developmental functions of the organisations were scored according to their content.

Statistical Methods

The principal statistical methods in the structural studies (the confirmatory factor analysis) and studies of the effects (path analyses) were based on the linear structural equation models (Lisrel) by Jöreskog & Sörbom (1986; 1993a,b); the method of weighted least

squares was applied. The changes were studied by the multiple analysis of variance of repeated measures (MANOVA) with the appropriate t-tests (Korhonen, 1989). The differences between the groups were measured by the one-way analysis of variance and the chi-square tests. SAS (v.6.03 & 6.04) and Survo (v. 4.23 & 4.27) were used as the main computer-programs (Mannfors et al., 1988; Mustonen, 1992)

Cross-Sectional Data

The reliability of the JDS and EZ methods was studied by Cronbach's alpha coefficients (Cronbach, 1965), the squared multiple correlation and the exploratory and the confirmatory factor analyses (Jöreskog & Sörbom, 1986; 1993a,b). The differences as for the background variables were studied by the chi square tests and the differences between the groups as to the core characteristics of work by the one-way analysis of variance.

The differences between the partial groups of the organisational functioning, the core job characteristics and the individual factors as to mental strain and sick absenteeism were studied by the one-way analysis of variance (Korhonen, 1989).

The effects between the organisational functioning, the job characteristics and the individual factors were studied by the path analyses of latent and observed variables and the regression analysis (Jöreskog & Sörbom, 1986; 1993a,b). The effects of the organisational functioning and the core job characteristics on sick absenteeism were studied by the regression analysis (Mustonen, 1992).

Longitudinal Data

The reliability of the JDS and the EZ methods was studied by Cronbach's alpha coefficients, squared multiple correlation, correlations between the factors in the different measurements and the confirmatory factor analysis. The changes of the organisational functioning, mental well being (ability to act) and job satisfaction were studied by the multiple analysis of variance of repeated measures (MANOVA) and the t-tests of dependent observations. The changes in sick absenteeism were studied by t-tests of dependent variables (table 2).

3. Results

Reliability and Validity of the Job Diagnostic Survey (JDS)

The Job Diagnostic Survey was shown to be a valid and reliable method in this data. The results confirmed the expected factor structure and the reliability of job characteristic dimensions. The factor and path analyses revealed that the perception of *job characteristics* differed from that of *organisational functioning*, *mental well being* and *the Sense of Competence for Development*. The factor structure seemed to be fairly stable in the different measurements (high correlations between the factors were found).

Reliability and Validity of the EZ (Eigenzustand) Method

The EZ method was shown to be a valid and reliable measure of *short-term mental work load*. The factor structure developed by Nitsch (1971) was verified by the confirmatory factor analysis. The reliability of the dimensions was fairly high. The factor structure seemed to be stable in the different measurements during the follow-up (1 year).

Preconditions for Successful Organisational Self-Improvement

Changes could be shown in organisational functioning, in organisational development, in the ability to act and in sick absenteeism (table 4).

The factors in connection with successful self-conducted organisational development were related to:

- *the foreman's role* (motivation, ability to organise, leadership, responsibility)

Table 4. The changes of organisational functioning, organisational development, the workers' ability to act and sick days^{a,p} during the follow-up (1 year) in the development (K1-K3), respective comparison one (V1-V5) and comparison two (V6-V8) organisations.

Organisational functioning, Development, Ability to act and proportional Sick absenteeism	K1	V1-V2	K2	V3	K3	V4-V5	K1-K3	V1-V5	V6-V8
Organisational functioning:^e (W)									
Willingness to develop working conditions	-		0		0		-		
Co-operation between supervisors and subordinates	0		+		0		0		
Collaboration between the workers	0		+		-		0		
Occupational safety and health (functioning)	0		0		0		0		
Occupational health care (functioning)	+		+		0		+		
Participation in organisational functioning	0		0		0		0		
Organisational development: (W)									
The leader of the development group of an organisation	SD		SU		SM				
Number of target organisations ^b	3		1		2				
Amount of actions (number) ^c	--		++		00				
Content of actions (number) ^c	--		++		00				
Distribution of actions ^c	--		++		--				
Feedback from the development group ^d	-		+		0				
Ability to act^e (EZ):	0	0	+	0	0	0	+	0	-
Sick days^{a,p} (W)							0	+	

K1-K3 = the development organisations; V1 - V5 = the respective comparison organisations; V6 - V8 = the comparison organisations II (another type of organisational development going on)

- p $(s/n) \times 100$, where s = the number of sick days and n = the number of the respondents in an organisation
- a Symbol indicating the increase (+), unchange (0) and decrease (-) in the amount of a factor between the measures 3 and 1
- b Number of the development organisation: 1 = one organisation; 2 = two organisations; 3 = more than two organisations
- c Amount of action in an organisation in relation to other organisations: ++ = the largest; 0 = the second largest; - = the smallest between the measurements: 1) second and first; 2) third and second measurements
- d ++ = the method is suitable; 0 = the method is worth developing; - = the method is not suitable for the development of organisations (according to the development group)
- SD Safety delegate as the leader of the development group
- SU Supervisor as the leader of the development group
- SM Safety manager as the leader of the development group
- EZ Measured by the EZ method
- W Measured by the author's questions

- *the role of the development group* (flexible composition and the way of functioning, well-appointed, active)
- *the size and location of the organisation* (the best was a small one at one location)
- *the organisational status of the change process* (moderate rate of change)
- *the development method* (the superiority of the used method vs. *learning by expanding* concerning *the ability to act*).
- *the organisational functioning*: increased co-operation between the supervisors and the subordinates and the collaboration between the workers were related to the increased number, content and distribution of the reported actions.

The Interrelationships Between Organisational Functioning, Job Characteristics and Mental Well-Being

Organisational Functioning and Mental Well-Being

Organisational functioning was related to mental well-being (motivation & mental strain), when measured by co-operation between supervisors and subordinates, collaboration between workers, functioning of occupational safety and health staff and the possibilities of participation. Increased organisational functioning contributed to increased mental well-being, and vice versa (figure 4).

When the workers perceived that the co-operation between the supervisors and subordinates, the collaboration between the workers and the occupational safety and health staff were functioning well, they felt mentally better than in the opposite case. The situation was the same as to the possibilities of organisational participation.

Job satisfaction was in connection with mental strain and ability to act. Co-operation between supervisors and sub-ordinates was connected with job satisfaction.

Participation was in connection with the co-operation between supervisors and sub-ordinates as well as the functioning of occupational safety and health staff.

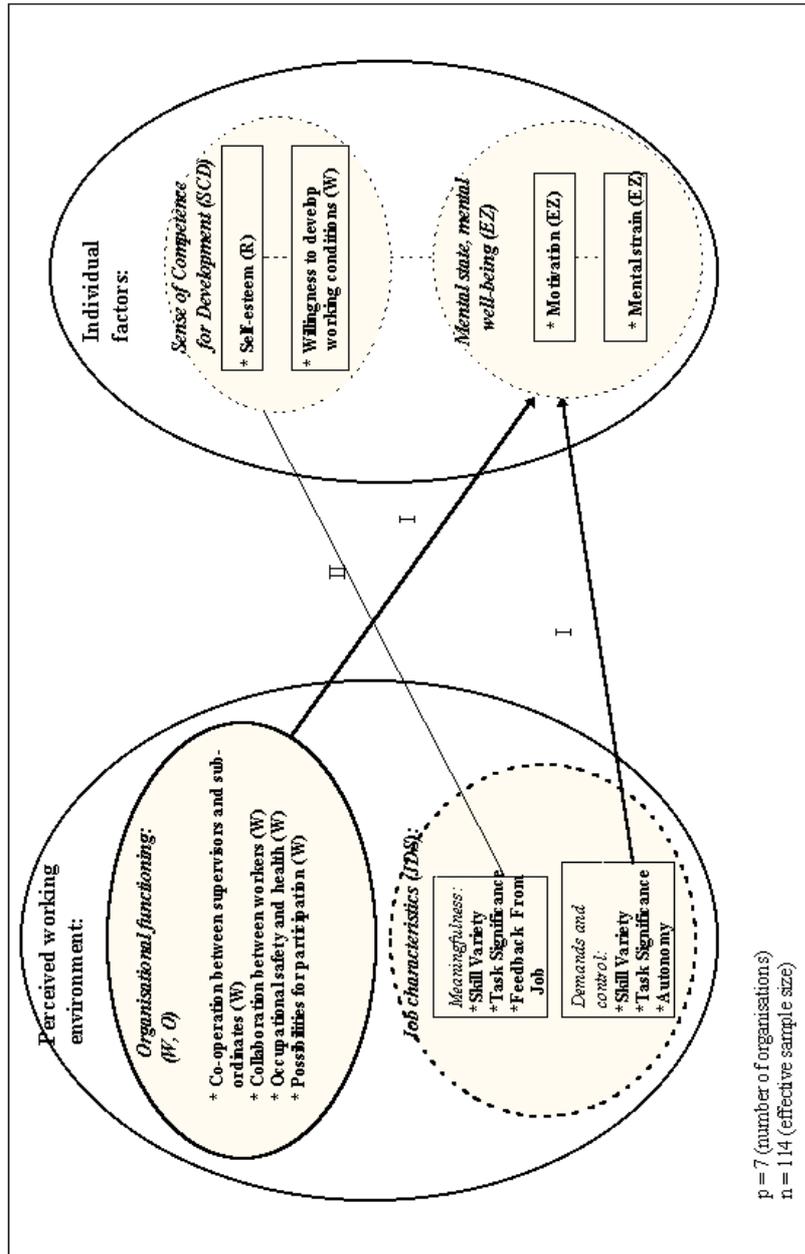


Figure 4. Relationships between perceived organisational functioning, job characteristics and individual factors. *Structural relationships* based on confirmatory factor analyses (I) and path analyses (II) with *latent variables* (factors)

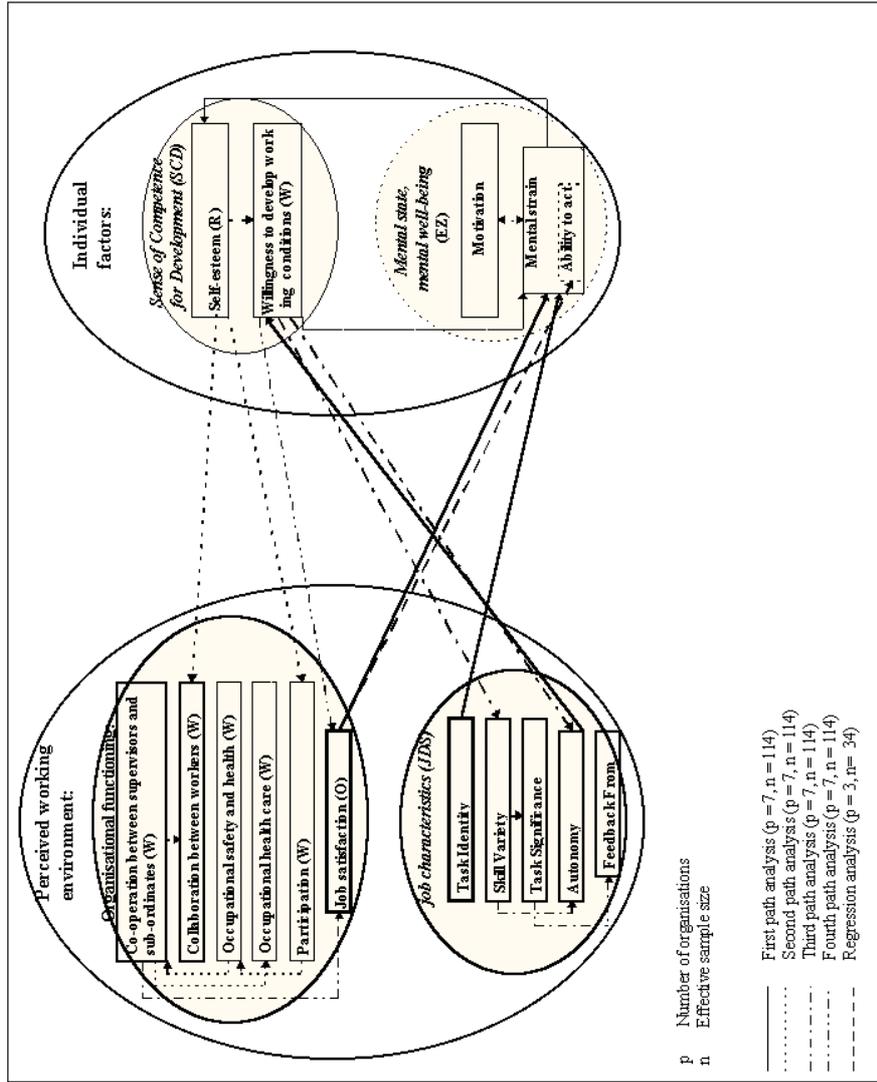


Figure 5. Combination of path analyses with the observed variables. Relationships between perceived organisational functioning, job characteristics and individual factors

Job satisfaction was also related to the willingness to develop working conditions, which in turn was in connection with self-esteem. Mental strain, which was in connection with job satisfaction, Task Identity, Autonomy and motivation (EZ), was also connected with self-esteem (figures 4 and 5).

Increased co-operation between the supervisors and the subordinates - which was due to increased possibilities of participation (via increased functioning of occupational safety and health staff) - increased job satisfaction, and vice versa. Also increased willingness to develop working conditions increased job satisfaction, and vice versa.

When the workers felt that the co-operation between the supervisors and the subordinates was better, they were also more satisfied with their job than in the opposite case. This perception was supported by the notion that the occupational safety and health staff was functioning well; this feeling in turn was affected by the workers' evaluation that they had greater possibilities of participation. - When the workers were more willing to develop working conditions, they were also more satisfied with their job than in the opposite case.

When the workers' job satisfaction increased, their mental strain decreased and their ability to act increased, and vice versa. When the workers were more satisfied with the job, they felt mentally less strained and more capable to act than in the opposite case.

When the workers' mental strain was lower, their self-esteem was higher, and vice versa. When the workers felt mentally less strained, they esteemed themselves higher than in the opposite case.

When the workers' self-esteem was higher, their willingness to develop the working conditions was greater, and vice versa. When the workers esteemed themselves higher, they also wanted to develop the working conditions more than in the opposite case.

Job Characteristics and Mental Well-Being

The job demands and job control (Skill Variety, Task Significance and Autonomy) were related to the mental well-being (motivation and mental strain), figure 4. The suitable job demands and control increased mental well-being, and vice versa. When the workers had greater opportunities to use their skills (the job content was "rich"), when - in their mind - the job was socially more significant and when they felt that there was more Autonomy in their job, their mental well-being was better than in the opposite case.

Task Identity and Autonomy were connected with mental strain. Increased Task Identity and Autonomy were connected with decreased mental strain; the latter decreased mental strain via willingness to develop the working conditions (figure 5). When the workers perceived that their tasks formed a perceptible whole and when they assessed that there was enough autonomy in their job, they felt mentally less strained than in the

opposite case. The perception of greater Autonomy increased willingness to develop the working conditions and thus the ability to act, and vice versa.

The Role of Individual Factors in the Perception of Working Environment

The Job meaningfulness (Skill Variety, Task Significance and Feedback From Job) and the Sense of Competence for Development (self-esteem and willingness to develop working conditions) formed a structural relationship (figure 6).

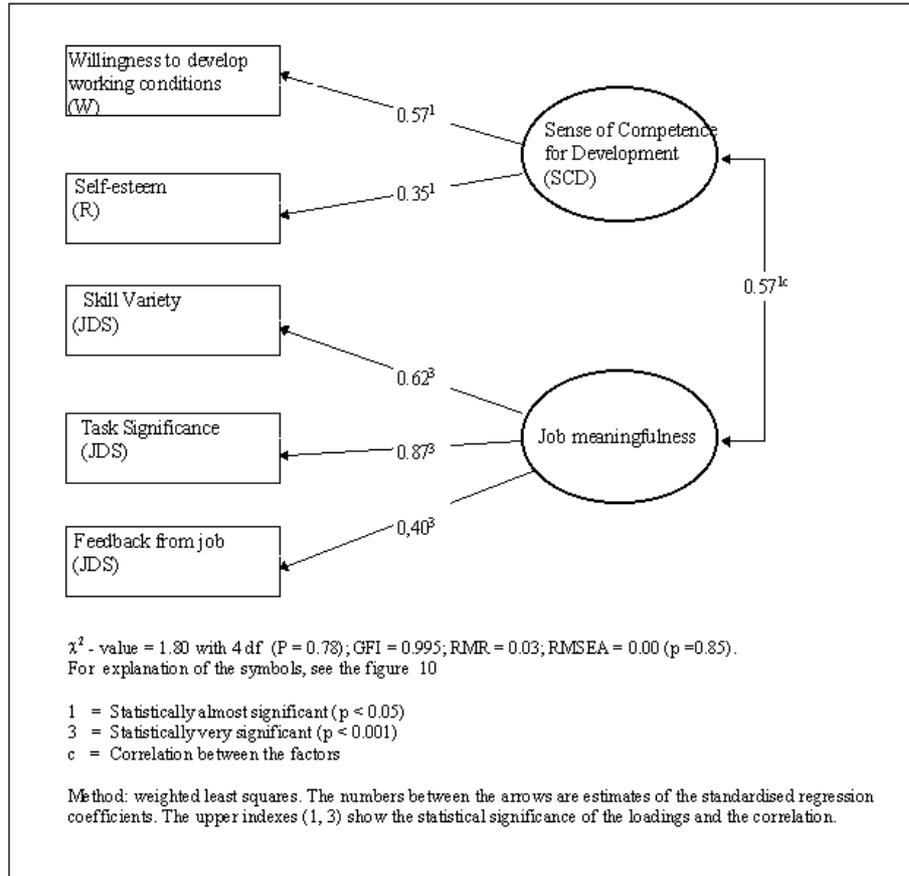


Figure 6. Sense of Competence for Development and Job meaningfulness. Confirmatory factor analysis.

Willingness to develop working conditions was in connection with Skill Variety and Autonomy; increased willingness to develop working conditions increased Skill Variety and Autonomy, and vice versa (figure 5). When the workers were more willing to develop the working conditions, they also felt that they could use their skills more properly (the "rich" work content) and that there was more Autonomy in the job than in the opposite case.

Skill Variety was related both to Task Significance and Autonomy (figure 5). Task Significance was related to Feedback From Job.

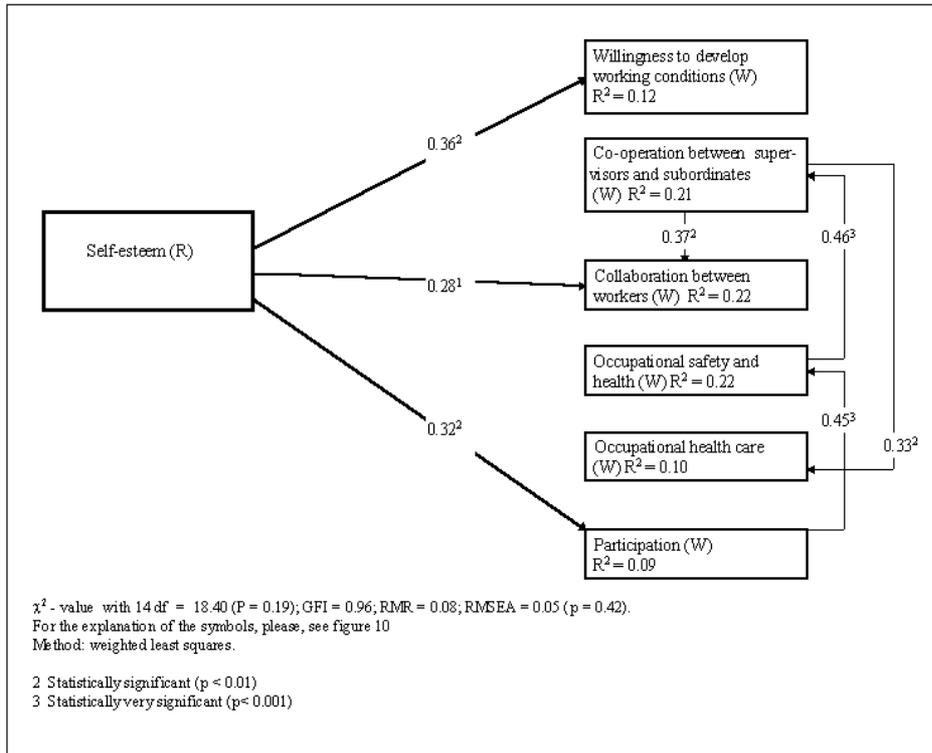


Figure 7. Relationship between self-esteem and perceived organisational functioning; path analysis with observed variables

Increased Skill Variety was in connection with increased Task Significance and Autonomy, and vice versa. Increased Task Significance was in connection with increased Feedback From Job, and vice versa. When the workers felt that they could use their skills more properly in the job, the work was - in their mind - also socially more significant and there was more Autonomy in their job than in the opposite case. When the workers felt that their job was socially more significant, they also assessed to get more feedback from the job than in the opposite case.

Self-esteem was in connection with organisational functioning, when the organisational functioning consisted of willingness to develop working conditions, collaboration between the workers and participation. The increase of self-esteem was in connection with increased willingness to develop working conditions, collaboration between the workers and participation, and vice versa (figure 7). When the workers esteemed themselves higher, they were more willing to develop working conditions; they assessed that the collaboration between the workers was better and that they had better possibilities of participation, and vice versa.

Relationships Between Individual Factors

Self-esteem was connected with willingness to develop the working conditions; increased self-esteem was in connection with increased willingness to develop the working conditions, and vice versa (figures 5 & 7) . When the workers esteemed themselves higher, they also wanted to develop more the working conditions than in the opposite case.

Increased willingness to develop the working conditions was in connection with decreased mental strain, and vice versa. Decreased mental strain was in connection with a higher self-esteem, and vice versa (figure 5). When the workers wanted to develop the working conditions, they felt mentally less strained, and they esteemed themselves higher than in the opposite case.

Emotional motivation and mental strain were related to each other (figure 8); increased (emotional) motivation was in connection with decreased mental strain, and vice versa; decreased mental strain was connected with increased emotional motivation. When the workers felt more motivated (emotionally), they felt mentally less strained, and vice versa.

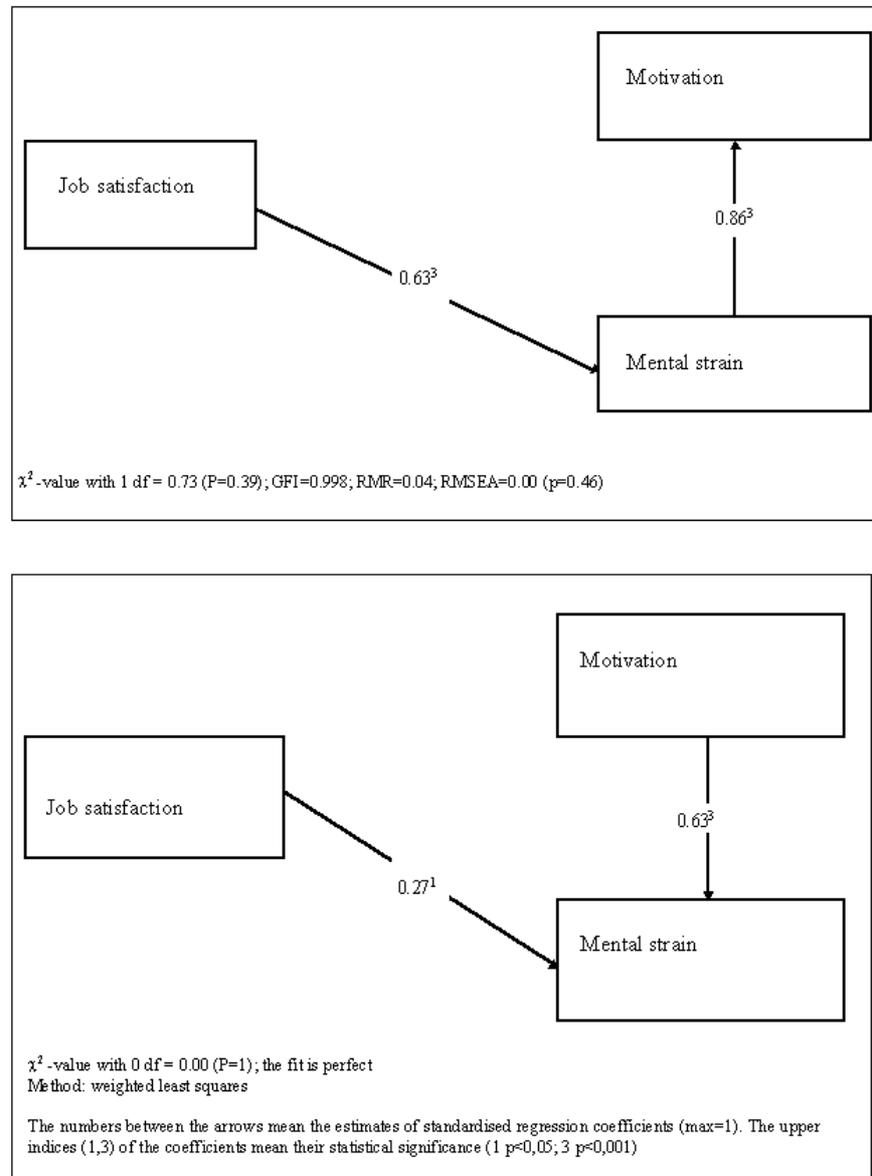


Figure 8. The interrelationships between job satisfaction and mental well-being measured by the EZ method. The upper figure: The impact of mental strain on motivation. The lower figure: The impact of motivation on mental strain.

Working Environment, Individual Factors, and Health

Increased collaboration between the workers was in relation with a lower rate of reported sick absenteeism in an organisation (figure 9). When the workers assessed that collaboration between the workers was better, they reported less sick days (in an organisation) than in the opposite case.

Skill Variety, Task Significance and self-esteem were connected with sick absenteeism. Self-esteem and Skill Variety were in connection with the number of sick days per organisation (figure 9). When the workers esteemed themselves higher and when they perceived that they could use their skills more widely in the job, they reported less sick days (in an organisation) than in the opposite case.

Task significance was connected with the number of sick days and the duration of the sick absenteeism period per worker (figure 9). When the workers assessed that their job was socially more significant, they reported less sick days and a shorter duration of the sick absenteeism period (per worker) than in the opposite case.

Article 1. The Reliability of the Job Diagnostic Survey (JDS) in Evaluating the Core Traits of Work

Targets, Materials and Methods

Due to a bit contradictory results of the earlier studies on the reliability of the Job Diagnostic Survey (JDS), the aim of the study was to clarify the reliability and validity of the method in the Finnish data (figure 2). The purpose was to verify the theoretical factor structure and to clarify its stability, and to clarify the reliability of the scales. The underlying theoretical Job Characteristics Model (JCM) was also the target of the study (Turner & Lawrence, 1965).

The target groups consisted of 15 public sector organisations representing the regional organisations of Posts and Telecommunications of Finland, and the Occupational Safety and Health Administration (N=367-506), table 1.

Some of the organisations formed the development group of seven organisations (K1-K7; n= 93-131); the comparison group (one) consisted of five organisations (V1-V5; n=72-123). There was also another comparison group (two) of three organisations (V6-V8; n=72-80). The data consisted of both the cross sectional (whole) data (n=184-326) and the longitudinal data (n=111-159). The two Finnish versions of JDS were applied by the Laboratory of Work Psychology and Leadership, Helsinki University of Technology (Vartiainen, 1989). The older version was used in the comparison group two.

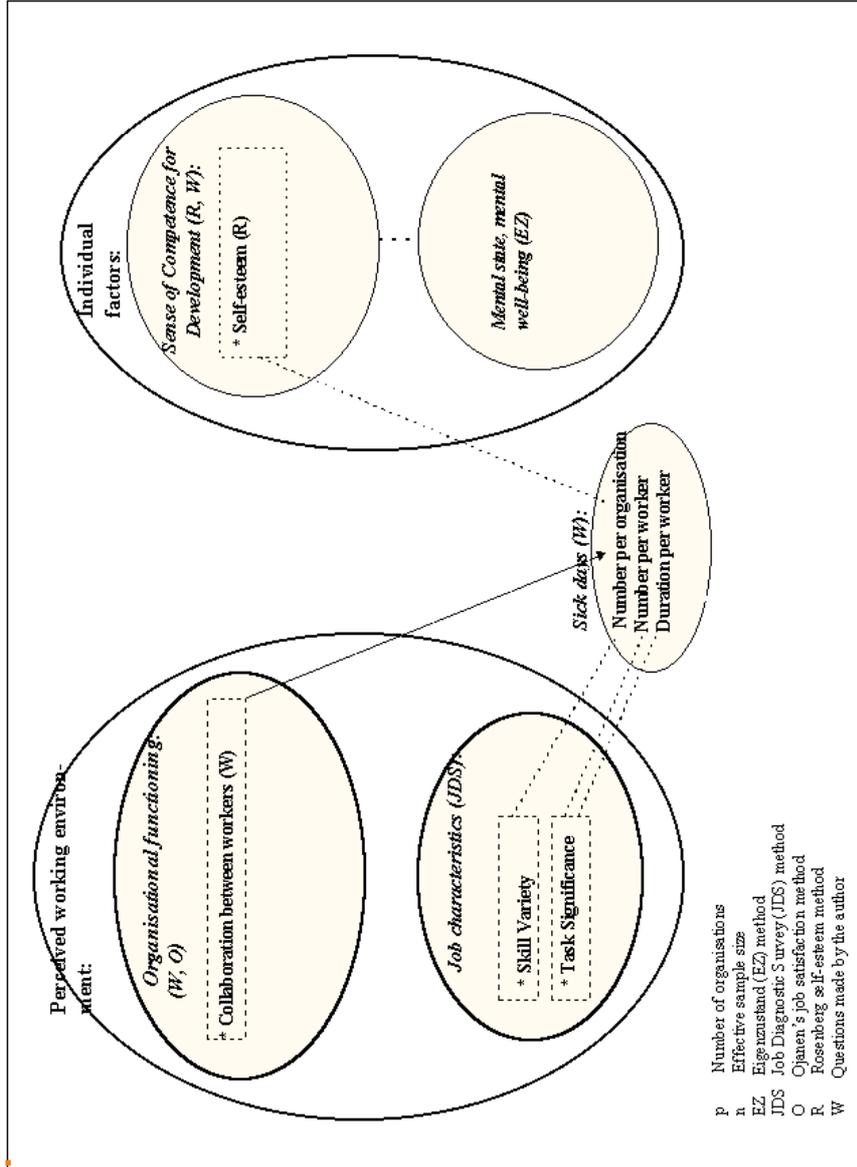


Figure 9. Relationships between perceived organisational functioning, job characteristics, individual factors and proportional sick absenteeism (p=5-12, n=18-46)

The principal statistical methods consisted of the explorative and the confirmatory factor analyses, Cronbach's alpha (Cronbach, 1965), and correlation coefficients. In the explorative factor analyses (varimax -solution) the maximum likelihood method was applied. Survo 84 C (v. 4.23) was used as a computer program (Mustonen, 1992). The data manipulations and the confirmatory factor analyses were carried out by the Prelis 2.0 and Lisrel 8.03 computer programs (Jöreskog & Sörbom, 1986, 1993a,b). The Cronbach's alpha coefficients were estimated by the SAS 6.03 program (Mannfors et al., 1988).

Reliability of the Scales

The reliability of the scales was moderate and comparable with the earlier results. The consistency of the answers was measured by the Cronbach's alpha coefficients in the whole and in the longitudinal data. The alpha coefficients varied between 0.54 and 0.90 in the whole and the longitudinal data, in the different groups and the different measurements (1-3). The explanation power of the items (reliability) was fairly high; the average explanation degree (R^2) varied between 0.58 and 0.61 in the different measurements in the whole data.

Reliability of the Factor Structure

The factor structure received by the newer version of the method was the expected one; the five factor solution was received. The permanence of the structure was fairly good.

Because the most international studies on the factor structure of the method were made by the exploratory factor analysis, the method was also used here for the reason of comparability. In the development group (K1-K7) and in the comparison group (V1-V5) one of the items was loaded on the five expected factors. Two items measuring Autonomy were also loaded on other dimensions. The explanation degree was 52.6% by the maximum likelihood method and 68.7% by the principal axis solution. A four factor solution was received by using the older version of the method in the comparison group two (V6-V8); the explanation degree was 58.5% by the maximum likelihood method and 68.8 % by the principal axis solution.

The theoretical, statistically significant factor structure models could be shown by the confirmatory factor analyses in the three successive measurements in the whole ($n^* = 165-254$) and in the longitudinal data ($n^* = 108-110$); in these analyses all the basic items of the dimensions were loaded on their own factors. P-values for Chi-squares of the models varied between 0.07 and 0.12 and the root mean residuals between 0.07 and 0.12

* Effective sample size

in the whole data. The models were not quite exact, however; the items of the other factors were also loaded on each factor. The factors were expected to correlate with each other and so they did; the correlations varied between -0.04 and 0.83 (average: 0.27-0.66; standard error 0.05-0.06).

The constancy of the factor structure was studied with dependent observations in the long run. The target group consisted of the comparison group one (V1-V5) organisations (n=56); there was not any other special development work going on in these organisations during the follow-up period (1 year). The factor structure was fairly stable and the correlations between the factors even in some cases exceeded the international comparison values.

Evaluation of the Job Characteristics Model (JCM)

The Job Characteristics Model (JCM) was evaluated by comparing the core job characteristics and the Work Motivation Potential (WMP) scores with inner job motivation and "growth" satisfaction in the longitudinal data. The expected correlations between the variables were got in all the measurements, although not all of them were statistically significant. In the comparison group two (V6-V8) nearly all the correlations were statistically significant.

Article 2. The EZ (Eigenzustand) Method as an Assessment Instrument of Work load: Evaluating the Validity and Reliability of the Method

Targets, Materials and Methods

The factor structure of the EZ method was verified by Nitsch (e.g. 1971) in the 1970s using a factor analysis application called the Bistran analysis (figure 3). The theoretical factor structure was not, however, verified by the confirmatory factor analysis earlier. A Finnish version of the method with 39 items was developed by the Laboratory of Work Psychology and Leadership, Helsinki University of Technology. The reliability of the version was shown to be fairly high, but there was little evidence of the stability of the method.

The aim of the study was to evaluate the reliability and the validity of the method. The Finnish version of the method with 39 items was used (Järvenpää, 1991; Kostama et al., 1992). The material consisted of 15 blue-collar worker organisations (N=184-326,

table 1). The data consisted of the cross-sectional (whole data, $n^* = 165-254$) and the longitudinal data ($n=111$). The target groups in both data consisted of the development group and the comparison groups 1-2. During one year 2-3 measurements were made; the intervals between the measurements were 6-12 months.

The stability of the factor structure of the method was studied by the confirmatory factor analyses in the different measurements both in the cross sectional and the longitudinal data. The confirmatory factor analyses were made concerning the factor structure of the highest level of the model (motivation, mental strain) in three successive (morning and evening) measurements in the whole data ($n^* = 180-279$); the corresponding measurements in the longitudinal data were made in the group which consisted of the development and the comparison group one organisations ($n^* = 106-111$). The confirmatory factor analyses concerning the middle level of the model (activation, efficiency, tension, ability to act) were only made in the whole data in three successive evening measurements. The correlations of the scales between the measurements were studied in the comparison group one (V1-V5) in the longitudinal data. The Pearson's correlation coefficients were used as a method.

Reliability of the Scales

The reliability of the scales was fairly high. The Cronbach's alpha coefficients, which measured the consistency of the scales, varied in the different groups and measurements between 0.54 and 0.96 (average 0.83-0.88). The reliability indices (R^2) of the linear explanation power of the scales varied between 0.21 and 0.96 (average 0.64 - 0.71)

Reliability of the Factor Structure

The expected factor structure could be shown on the highest (motivation, mental strain) and on the middle (activation, efficiency, tension, ability to act) hierarchical levels of the model. The topmost general concept of "mental state" could not be verified in this study. The stability of the factor structure was fairly high.

As a result of the confirmatory factor analyses it could be shown that the factor structure of the EZ method resembles the expected one on the highest and on the middle hierarchical levels of the model; the expected items were loaded on each factor. For the highest level, the P values of the chi square test (P) varied in the different measurements between 0.02 and 0.16; *the goodness of fit indices* (GFI) varied between 0.98 and 1.00 and the standardised root mean square residuals (RMR) between 0.04 and 0.11. The

* Effective sample size

corresponding values for the middle level were (P) 0.03 - 0.22; (GFI) 0.990 - 0.996 and (RMR) 0.04 - 0.06.

The correlation coefficients of the items between the different measurements (n=56) varied from 0.51 to 0.73 on the highest level, from 0.41 to 0.76 on the middle level, and from 0.28 to 0.72 on the lowest level of the model. The correlations were statistically significant ($p < 0.01$), except the correlations of the item *sleepiness*, which was statistically almost significant ($p < 0.05$).

Statistical Analyses

The weighted least squares were used as a statistical method in the confirmatory factor analyses. The data manipulations and the confirmatory factor analyses were made by using the Prelis 2.03 and Lisrel 8.03 programs (Jöreskog & Sörbom, 1986, 1993a,b); the alpha coefficients were estimated using the SAS program (v. 6.03) (Mannfors et al., 1988).

Article 3. Organisational Self-Improvement and Mental Work Load

Targets, Materials and Methods

In this study, functioning was seen as one of the typical features of a healthy organisation. The concept was defined as willingness to develop working conditions, co-operation between supervisors and subordinates, collaboration between workers, functioning of occupational safety and health staff and occupational health care and possibilities of participation.

Many organisations use outside experts as an aid in the development process. The underlying (unwritten) presumption in this study was that functioning (healthy) organisations can develop their working conditions themselves by the given (simple problem solving) method. The goal of the study was to find out how organisations can develop their working conditions without outside expertise, and whether the development process influences the mental well-being (work load) of the members of the organisations.

The longitudinal data material consisted of 11 organisations of the regional administration of Posts and Telecommunications of Finland and the Occupational Safety and Health Administration (table 1). Three of the organisations were development organisations, where special development processes on the author's initiative were going on. In one of the organisations (K1), the permanent foreman was missing because of

illness. The development process was arranged by a group led by the safety representative. The group was elected by the personnel and consisted of officials.

In another development organisation (K2) there was a motivated and efficient foreman, who was able to arrange the work of the development group. The foreman was leading the group, another permanent member was the vice foreman and the other members varied according to the matters to be handled.

The third development organisation (K3) was led by the safety manager of the workplace. The employer had chosen the members of the group, who were officials. This workplace had organisational changes in front of it.

Five organisations (V1-V5) formed the comparison group one, where no special development processes were going on. The comparison group two consisted of three organisations (V6-V8), where development processes were going on by *the method of learning by expanding* (Engeström, 1987).

The organisations were followed for one year; 2 - 3 measurements were made to evaluate the functioning of the organisations and the workers' mental well-being. Mental well-being was measured twice per day (at the beginning and at the end of the work day). *The organisational functioning was assessed by six questions made by the author concerning the co-operation between the supervisors and the subordinates; the collaboration between the workers, the functioning of occupational safety and health staff and occupational health care, the possibilities of participation and willingness to develop the working conditions.* Improvement of job satisfaction was measured by the method developed by Ojanen (1988). The changes in mental well-being (work load) were measured by the 39-item Finnish version of the EZ (Eigenzustand) method (e.g. Kostama et al., 1992).

The multivariate analysis of variance of repeated measures (MANOVA) was used as a statistical method for evaluating the changes in organisational functioning and mental well-being during the follow-up period (1 year). T-tests (Hotelling T^2) for dependent observations were also used (Korhonen, 1989). These methods were also used for studying the impacts of the perceptions of organisational functioning on mental well-being.

The differences between the organisations by the background variables (gender, age, education, job experience) were studied by the chi-square tests and the Mann-Whitney test (Mustonen, 1992); the latter is purposed for the evaluation of small samples.

The relationships of the background variables with the organisational functioning and mental well-being were studied by the chi-square tests (Mustonen, 1992). The differences between the organisations in organisational functioning and mental well-being were studied in pairs by the T-tests (Tukey-Kramer) for independent observations (Korhonen, 1989).

The representativeness of the sample compared with the whole material was studied by the chi-square and the Wilcoxon tests; the latter one is purposed for the com-

parison of the distribution of the observations in pairs. The Survo 84 C (v. 4.27) was used as a main operating system (Mustonen, 1992).

The data did not differ from the main data (respondents and non-respondents) in relation to background variables gender, age, education. Neither did the data differ from the main data (respondents) as to gender, age, education and job experience.

Changes in Organisational Functioning

It could be shown that the organisational functioning improved according to some indicators in the development groups during the follow-up period (table 4). The results were, however, a bit contradictory as to job satisfaction. By the exploratory factor analysis the job satisfaction was loaded on the factor of functioning; so it could be used as an overall measure of the perceived organisational functioning. The job satisfaction decreased in the development groups and increased a bit in the comparison groups during the follow-up period, although the changes were of no statistical significance.

In the development group (K1-K3) the workers' willingness to develop the organisations by *the method used* decreased during the follow-up (1 year); especially this was the case in the organisation (K1, $n^* = 20-21$ $p < 0.01$) where the foreman was absent due to sickness.

In the two organisations (K2, $n^* = 8-9$ and K3, $n^* = 9$) as a group, the workers assessed that the co-operation between the supervisor and the subordinates increased statistically almost significantly ($p < 0.05$) between the second and the third measurement. In one of the organisations (K2) the workers assessed that the co-operation between the supervisor and the subordinates increased statistically significantly ($p < 0.01$) during the follow-up.

In one organisation (K2, $n^* = 8-9$) the workers perceived that the collaboration among the workers increased during the follow-up period. The change was symptomatic ($p < 0.1$) between the measurements 1 and 3 and statistically significant ($p < 0.01$) between the measurements 2 and 3.

In the development group (K1-K3, $n^* = 37-39$) the workers assessed that the functioning of the occupational safety and health staff first decreased (between 1 and 2 measurements, $p < 0.1$) and then increased symptomatically (between 2 and 3 measurements, $p < 0.1$).

In the development group (K1-K3, $n^* = 39-40$) the workers assessed that the functioning of occupational health care increased statistically significantly ($p < 0.01$) during the follow-up period.

* Effective sample size

No changes could be shown as to the possibilities of the participation in the development organisations during the follow-up period.

Organisational Development

The fewest development functions were reported by the organisation K1. The second least amount of development steps was reported by the organisation K3; the most functions were reported by the organisation K2 (table 4).

Process Evaluations of the Development Groups

The development group of the organisation K1 reported that the method used was not suitable. One of the organisations (K2) reported that it was suitable for organisational development. The development group of the organisation K3 reported that the method was worth developing (table 4).

Changes in Mental Well-Being (Work Load)

Changes in mental well-being were especially shown concerning the ability to act. The general trend was that the ability to act increased in the development group (K1-K3), remained unchanged in the comparison group one (V1-V5), and decreased in the comparison group two (V6-V8) (table 4).

In the development group (K1-K3, $n^* = 38-39$) the workers assessed that the ability to act increased during the follow-up period. The changes were statistically almost significant ($p < 0.02$) between the measurements 1 and 2 and between the first and the third measurements ($p < 0.05$). In the corresponding comparison group one (V1-V5, $n^* = 54-56$) no changes were observed. In the comparison group two (V6-V8, $n^* = 41-47$) the workers assessed that the ability to act decreased. The change was symptomatic ($p < 0.06$).

In the development organisation K1 ($n^* = 20-22$) the workers assessed that the ability to act increased between the measurements one and two; the change was symptomatic ($p < 0.06$). In the corresponding control organisation (V1, $n = 13$) no changes were perceived. In the development organisation K2 ($n^* = 8-9$) the workers perceived that the ability to act increased during the follow-up period (1 year); the change was symptomatic ($p < 0.1$). In the corresponding control organisation V3 ($n = 12$) no changes were observed.

* Effective sample size

in the development organisation K3 ($n^*=8-9$) the workers perceived that the ability to act increased between the measurements 1 and 2; the change was symptomatic ($p<0.1$). No changes were perceived in the corresponding control organisations (V4, $n^*=8-9$ and V5, $n=5$).

Article 4. A Well-Functioning Organisation and Properly Demanding Work Increase Motivation, Decrease Mental Strain, and Improve Self-Esteem

Targets, Materials and Methods

It could be shown in the previous studies (Study III, originally published 1996) that organisational functioning was in connection with the changes of the workers' mental state during the self-conducted organisational development process. This was especially true as to the ability to act. Causal effects, however, could not be shown between the variables. Neither were possible the mediatory psychological processes studied.

This study clarified the influences of organisational functioning and job characteristics on the workers' mental well-being and the role of cognitive factors in this process. The material consisted of the regional workplaces (12 altogether) of Posts and Telecommunications of Finland and the Occupational Safety and Health Administration (table 1). Both the development and the control organisations were the target groups. The material consisted of both the longitudinal (three measurements, $n=96$) and cross-sectional (one measurement, $n=254$) data.

The cross sectional data was used for studying the relationships between organisational functioning, job characteristics, mental well-being (motivation, mental strain) and cognitions (self-esteem, willingness to develop the working conditions). The target groups consisted of seven development organisations (K1-K7; $n=131$) and five control organisations (V1-V5; $n=123$). The relationships of sick absenteeism with self-esteem and job characteristics were studied in the development organisations (7 cases, $n=131$), control organisations (5 cases, $n=123$) and in the whole data (12 cases, $n=254$) as a group. The changes in sick leaves during the follow-up time (1 year) were studied by the longitudinal data. The target group consisted of three development organisations (K1-K3; $n=40$) and five control organisations (V1-V5; $n=56$).

The JDS method was used for evaluating job characteristics and the EZ method for evaluating mental well-being. Job satisfaction was measured by Ojanen's job satisfaction method (Ojanen, 1988). Organisational functioning and sick absenteeism were measured by questions made by the author. Self-esteem was measured by Rosenberg's

self-esteem scale (Rosenberg, 1979). The consistency of the method was esteemed by the Cronbach's alpha coefficients (Cronbach, 1965), which varied between 0.80 and 0.90 .

The statistical methods consisted of correlation matrices, the analyses of variance (ANOVA) by Korhonen (1988), the explorative and confirmatory factor analyses, path analyses with latent and observed variables, regression analyses, and T^2 -tests (table 2). Survo 84 C (v. 4.27) was used as a basic program (Mustonen, 1992). Prelis 8.12 (W) was used in the data manipulations and Lisrel 8.12 (W) was used in the path analyses (Jöreskog & Sörbom, 1993a,b).

Connections Between Variables and a Preliminary Structural Analysis

The variables of organisational functioning, job characteristics, mental well-being and individual factors correlated with each other nearly throughout the whole material. Five measures were used in the exploratory factor analysis based on the correlations of the variables. The organisational functioning, the job characteristics, the mental well-being, the job satisfaction and the self-esteem were measured by these methods. In the measures there were 15 items (questions) altogether.

As a result of the exploratory factor analysis the three factors were received: *organisational functioning*, *job challenge and control* and *mental well-being*. The explanation degree of the model was 39%; the factor of mental well-being accounted for the main part of the total variance of the model (16%).

Confirmation of the Discovered Factors

The preliminary factor structure, received by the exploratory factor analysis, was confirmed by the confirmatory factor analysis (χ^2 -value=35.31 with 24 df, P=0.06; GFI=0.97; RMR=0.08). For the explanation of the symbols see figure 10.

The following items were loaded on the factor of *organisational functioning*: co-operation between the supervisors and the subordinates, co-operation between the workers, functioning of the occupational safety and health staff and participation.

The job characteristics: Skill Variety, Task Significance and Autonomy were loaded on the factor of *job challenge and control*. The items of mental well-being, motivation and mental strain were loaded on the factor of *mental state*. The loadings of the items were statistically very significant ($p < 0.001$) varying between 0.46 and 0.90. The correlations of the factors varied between 0.22 and 0.48. The reliability indices of the linear explanation power of the items (R^2) varied between 0.21 and 0.81 (mean 0.47).

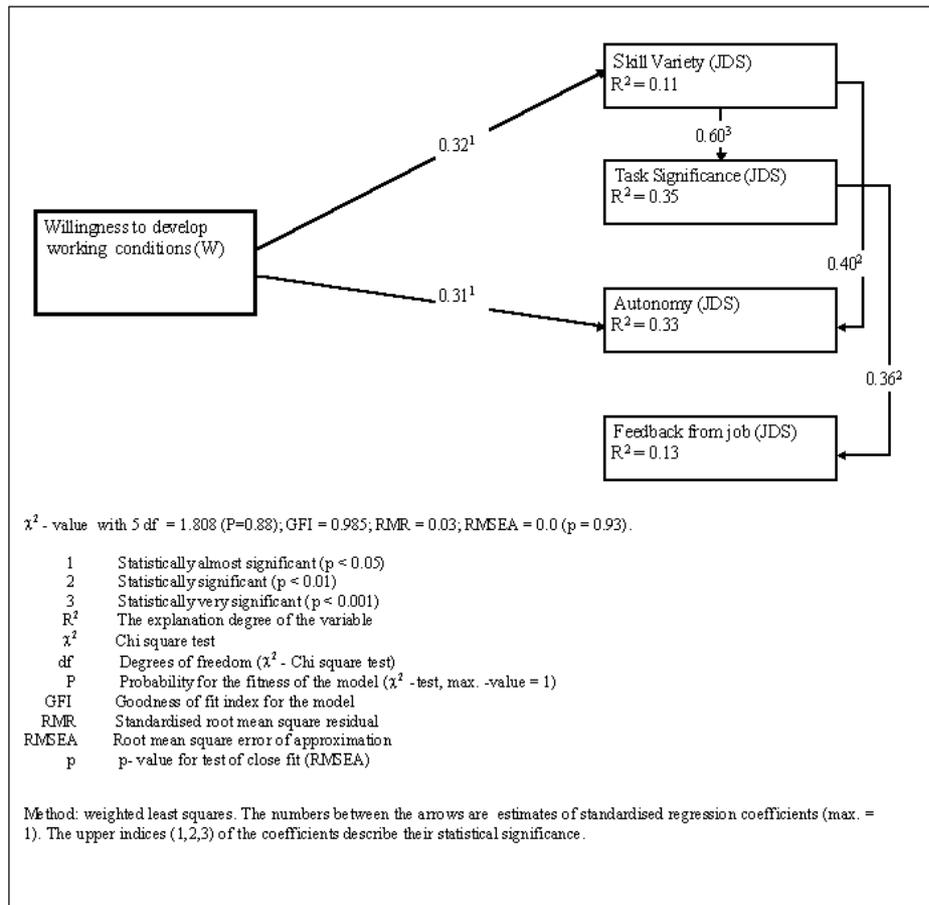


Figure 10. The interrelationships between willingness to develop working conditions and job characteristics; path analysis with observed variables.

The Impacts of Organisational Functioning and Job Challenge and Control on Mental State

When the workers assessed that the organisation was functioning better, they also felt mentally better. The organisational functioning and the job challenge and control accounted for 25% of the mental well-being in the model, which was also the explanation

degree of the model (figures 4 and 5). The used variables were the same as described above. The model was discovered by the path analyses of latent variables (χ^2 -value=40.86 with 24 df, P=0.02; GFI=0.96; RMR=0.09)

The Influence of Job Satisfaction, Job Control and Willingness to Develop the Working Conditions on Mental Strain and Self-Esteem.

When the workers were satisfied with their job, they also perceived less mental strain. The case was the same when they perceived that the job formed an understandable entity and they had the possibility of control in the job.

Job satisfaction (measured by M. Ojanen's question), Task Identity and Autonomy explained 64% of the ability to act (figure 5). The impact of Autonomy was mediated by the authormade item willingness to develop working conditions; Autonomy accounted for 22% of the variance of this item. The ability to act accounted for 11% of the variance of self-esteem. This procedure was carried out by the path analyses of observed variables (χ^2 -value=5.26 with 7 df, P=0.63; GFI=0.99; RMR=0.06).

When the workers' self-esteem was higher, they also perceived that the collaboration between the workers and the possibilities of participation were better than in the opposite case. They were also more willing to develop working conditions *by the method used*. These influences were shown in another path analysis of observed variables (figure 7). The workers' self-esteem did not influence mental state (motivation or mental strain) directly or the way of perceiving the job characteristics.

Changes in Sick Absenteeism

In the development group (K1-K3; n=40) the proportional sick absenteeism told by the workers decreased between the second and the third measurements; the change was statistically almost significant ($p < 0.02$). In the comparison group (V1-V5; n =56) the sick absenteeism increased during the follow-up period; the increase between the first and the second measurements was symptomatic ($p < 0.1$), and respectively the change between the second and the third measurement was statistically nearly significant ($p < 0.03$).

Connections of Sick Absenteeism with Job Characteristics and Individual Factors.

The sick absenteeism given by the workers was in connection with their assessment of the co-operation between the workers, Skill Variety, Task Significance and self-esteem (figure 9).

When the workers perceived that the co-operation between the workers was better, they had fewer sick days than in the opposite case. The co-operation between the workers accounted for 14% of the number of sick days in the development organisations. The method used was the regression analysis (p value for F-test: 0.06); the result was symptomatic.

When the workers perceived their job socially more significant, they had fewer sick days than in the opposite case. This was true both as to the number of sick days per worker in all the groups and as to the duration of sick period per worker in the comparison groups and in the whole data. The statistical significance of the differences between the two partial groups "the much" (>mean) and "the little" (<mean) of a certain job characteristic varied between symptomatic ($p < 0.1$) and very significant ($p < 0.001$). When the workers assessed that they could use their skills more in the job (Skill Variety), they had a tendency to have fewer sick days than in the opposite case. This was the case as to the number of sick days per organisation in the development group. The difference between the two partial groups was symptomatic ($p < 0.1$).

When the workers perceived that their self-esteem was higher, they had fewer sick days than in the opposite case. This was true considering the number of sick days per organisation in the development group and in the whole data. The differences between "the much" and "the little" partial groups were respectively statistically nearly significant ($p < 0.05$) and symptomatic ($p < 0.06$).

Connections of Context Variables with Mental State, Job Characteristics, Self-Esteem and Sick Absenteeism

In the younger groups (< 25 yrs. and 35-44 yrs.), the workers perceived their motivation higher and mental strain lower than in the oldest age group (>55 yrs.). As to motivation, the differences were respectively statistically significant ($p < 0.01$) and almost significant ($p < 0.05$). As to mental strain, the differences were smaller than in motivation; the differences of both the groups compared with the oldest age group were symptomatic ($p < 0.1$).

The workers' basic educational level was in connection with their mental state. Secondary school graduates perceived their motivation higher and mental strain lower than those with a lower level of education. The differences in motivation and mental strain were statistically significant ($p < 0.01$) and respectively almost significant ($p < 0.05$).

Men considered their job more autonomous than women. The difference was statistically very significant ($p < 0.001$). The workers with occupational education perceived more Autonomy in their job compared with those with the basic level of education. The statistical significance of differences varied between almost ($p < 0.05$) and very significant ($p < 0.001$).

Age accounted for 9% of the variance of the personal sick absenteeism in the whole data ($n=254$, $n^* = 26$); along with age the sick absenteeism increased, too. The used statistical method was the regression analysis (p value for F-test: 0.042). The model was statistically almost significant.

The Supplementary Studies

The need for supplementary studies arose partly on the basis of the author's previous studies, partly of the findings in the literature of the area. The previous studies gave some information about single problems presented and studied. The findings gave the author the impulse to link the single findings together and to collect more knowledge about the interrelationships between the factors, especially about the role of individual factors in the process. For example the previous studies gave little information about the interrelationships of the individual factors and the perceived job characteristics. The question was important to clarifying the role of the underlying theory about the individual factors in the perception of the job characteristics.

There also arose a question of the possible intermediary factors between organisational functioning and mental well-being on the basis of the previous studies. Especially interesting was the role of job satisfaction in this process.

Also the question about the interrelationships of the individual factors was left open; of special interest was the question whether the so called cognitive and emotional factors were loaded on the same or different factors. To answer these questions, it was decided to carry out a few additional studies described below.

A Relationship Between Job Characteristics and Individual Factors

It could be shown that the cognitive factors (in the previous studies) and the perceived job characteristics formed a factor structure of two factors (figure 6). The factors were, however, correlated with each other.

The material consisted of the cross-sectional data of the seven development organisations (K1-K7, $n=131$). The relationships between the job characteristics and the

* Effective sample size

individual factors were studied by the confirmatory factor analyses. A factor structure with two factors: *the Job meaningfulness* and *the Sense of Competence for Development* was received. The factor of Job meaningfulness consisted of the items Skill Variety, Task Significance and Feedback From Job. The items willingness to develop the working conditions and self-esteem formed the factor of Sense of Competence for Development (χ^2 -value=1.80 with 4 df, P=0.78; GFI=0.995; RMR=0.03).

The method used was the weighted least squares and the program Lisrel 8.12 a (W). No statistically significant influences of the variables on each other could be shown by the path analyses of latent variables (factors), figure 6.

B The Impact of Willingness to Develop Working Conditions on Job characteristics

When the workers felt greater willingness to develop the working conditions, they perceived that they could use their skills more properly ($p<0.05$) in the job, and that there was also more Autonomy ($p<0.05$) in their job than in the opposite case (figure 10).

When the workers perceived that they could use their skills more properly, they perceived that the job was socially more significant (Task Significance) ($p<0.001$) and there was more Autonomy in their job ($p<0.01$).

When the workers assessed that the job was socially more significant, they perceived that they received more feedback from their job ($p<0.01$).

The interrelationships of the willingness to develop working conditions and the job characteristics were studied by the path analyses of observed variables (figure 5). The received model was statistically good enough (χ^2 -value=1.808 with 5 df, P=0.88; GFI=0.985; RMR=0.03) The used statistical method was weighted least squares. The material consisted of the cross sectional data of the seven development organisations (K1-K7; n=131)

C Organisational Functioning, Job Satisfaction, Willingness to Develop Working Conditions and Mental Strain

When the workers assessed that the co-operation between the supervisors and the subordinates was better and they were keener to develop the working conditions by the method used, they were also more satisfied with their job, and vice versa (figure 11).

The impact of the organisational functioning and the willingness to develop working conditions on job satisfaction was studied by the path analysis of the observed variables. The influences of the variables on job satisfaction were respectively statistically very ($p<0.001$) significant and almost significant ($p<0.05$). The fit of the model was

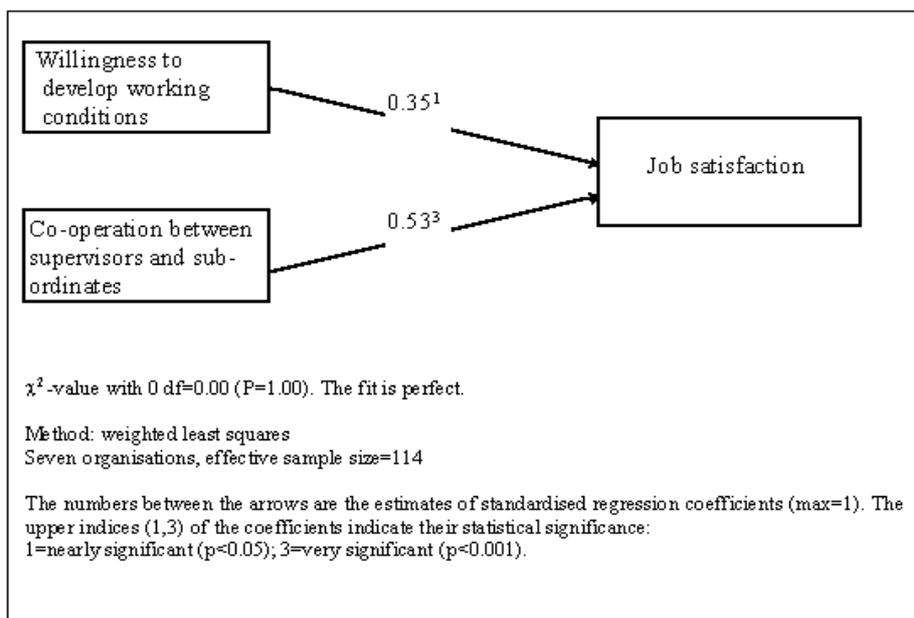


Figure 11. The interrelationships between willingness to develop working conditions, co-operation between supervisors and subordinates and perceived job satisfaction. Path analysis with observed variables.

perfect; chi square with 0 degrees of freedom was 1.00. The material consisted of the cross sectional data of seven development organisations (K1-K7; n=131).

It was also found that when the workers' job satisfaction was higher, their ability to act was also higher, and vice versa. The impact of job satisfaction on mental well-being was studied by the regression analysis. The material consisted of the cross-sectional data of the three development organisations (K1-K3; n^{*}=34). The influence was statistically very significant (P value for F-test <0.001) with t-value 4.50 and the standardised regression coefficient 0.62. The explanation degree of the model ($R^2 = 0.387$) was 39% (figure 5).

The relationships of the job satisfaction and mental strain were studied by the path analyses with observed variables (χ^2 -value=0.73-0.00 with df=0.73-0.00; P=0.39-1.00; GFI=0.998-1.00; RMR=max: 0.04), figure 8. The material consisted of the cross sectional data of the seven development organisations (n=131) (figure 8).

The job satisfaction had a statistically very significant impact on motivation via mental strain (p<0.001), but also motivation had a statistically very significant influence on mental strain (p<0.001).

* Effective sample size

When the workers were more satisfied with their job and emotionally more motivated, they also felt mentally less strained, and vice versa. When the workers perceived less mental strain, they were also better emotionally motivated than in the opposite case.

D Structural Relationships between Individual Factors

No statistically significant structural relationships could be found. The structural relationships between the factors, the Sense of Competence for Development and mental well-being were studied by the confirmatory factor analysis. Despite of some good statistical indices (e.g. GFI, RMR), the models received were not acceptable because of the poor Chi square values ($P = 0,00$). In the first run also the error variance of motivation was negative perhaps because of the fairly small sample size (χ^2 -value = 19.901; $df=1$; $P=0.00$; $GFI=0.968$; $RMR=0.07$). When forced positive in the second run, the model still remained unacceptable (χ^2 -value = 32.150 with 2 df ; $P=0.00$; $GFI=0.948$; $RMR=0.07$).

4. Discussion

The Main Findings

The Finnish version of the Job Diagnostic Survey is a valid and reliable method (page 60).

The Finnish version of the EZ method (39 items) is a valid and reliable method with a stable factor structure. The method measures job strain connected with structural job characteristics (page 62).

People in an organisation can develop their working conditions (functioning and ability to act) by themselves on specific conditions (page 64).

There is evidence of such general perceptive relationships between working environmental and individual factors that can neither be explained by an individual's perception in a specific organisation nor by the characteristics of the organisation. The working environment perceived by a worker is connected with the objective, structural environmental factors of the organisation (page 69).

Better organisational functioning increases a worker's mental well-being, and vice versa. A worker feels mentally better when co-operation between supervisors and subordinates, co-operation between workers, the functioning of the occupational safety and health system and the possibilities of participation are better than in the opposite case (page 73).

Mental well-being influences self-esteem. When workers feel mentally less strained and more (emotionally) motivated, they esteem themselves more (page 76).

Structural job characteristics (Skill Variety, Task Identity, Task Significance and Autonomy) influence mental well-being. A worker feels mentally healthier when the work offers more challenges than he or she can cope with; when the job has more social

meaning and when there are more possibilities to control the way of working than in the opposite case (page 78).

Job satisfaction has an intermediary role in the perception of organisational functioning and mental well-being: better organisational functioning increases a worker's mental well-being via the perception of increased job satisfaction, and vice versa. The greater a worker's possibilities of participation are, the better the functioning of occupational safety and health staff and the co-operation between supervisors and sub-ordinates is, the more satisfied with job and the mentally healthier (the mentally less strained and more motivated) a worker is, and vice versa (page 80).

The Sense of Competence for Development (SCD) has an intermediary role in the perception of a working environment; mental state (well-being) influences the perception of organisational functioning and job characteristics via the SCD (page 81).

When workers esteem themselves more, they also perceive that co-operation between the workers is better and the possibilities of participation are better than in the opposite case (page 83).

When workers esteem themselves more, they want to develop working conditions further and they perceive that their job offers more challenges with possibilities to come off with it than in the opposite case (page 85).

Mental well-being and the Sense of Competence for Development (SCD) form a functional unity. A worker's emotional (mental strain, motivation) and perceptive (self-esteem, willingness to develop working conditions) functions work together (page 86).

Good characteristics of job are in connection with decreased sick days. When workers can use their skills more properly in the job, and when the job is socially more meaningful, they are less absent due to sickness from the job than in the opposite case (page 87).

Increased self-esteem is in connection with decreased sick absenteeism. When workers esteem themselves more, they are less absent from the job due to sickness than in the opposite case (page 89).

Co-operation between workers influences a person's health. When co-operation between workers is better, a worker is less absent from the job due to sickness than in the opposite case; a lower sick absenteeism is a sign of a better co-operation between workers (page 90).

The Methods: Confirming the Old and Acquiring New Knowledge

The Job Diagnostic Survey (JDS): The Interface Between External and Internal Factors

It could be shown that the Finnish version of the Job Diagnostic Survey is a valid and reliable method compared with the results of international studies (Study I, originally published 1994). A five-factor solution of the core job characteristics was received by the newer version of the method. The reliability of the scales was shown to be satisfactory. The stability of the factor structure seemed to be fairly good in the light of the longitudinal studies (Study I, originally published 1994). The conclusions drawn on the basis of the results of the confirmatory and path analyses (Study IV, originally published 1997) indicated that the method measured real structural job characteristics; the material was based on the data of seven separate organisations.

The consistency of the replies seemed to be fairly good in the Finnish data (Vartiainen, 1989) and presumably as for international studies (Taber & Taylor, 1990). The items also explained fairly well the core characteristics of the JDS with some exceptions. In this respect the results gave support to the theoretical model of the JDS (e.g. Hackman & Oldham, 1975; Turner & Lawrence, 1965).

The results concerning the factor structure of the method supported the theoretical model; the structure of the JDS seems fairly satisfactory by the exploratory factor analysis (varimax) in the data used. A five factor solution was received in the data of the actual target groups [(K1-K7) + (V1-V5)]; only two items were loaded also on a different factor. In other Finnish data (Vartiainen, 1989), the number of unexpectedly loaded items was three.

In international studies the number of factors has varied from two to six (e.g. Taber & Taylor, 1990; Brannon et al., 1988). The results of the study did not give support to assumptions about the impact of sample size on the results (Idaszak et al., 1988).

The results by the older version of the method in the data of the comparison group two (V6-V8) were poorer: instead of the expected five factors, only four factors were found. The result was in accordance with that presented by Cordery & Sevastos (1993). Thus the results supported the recommendations of Kulik et al. (1988) about the use of the newer version of the method. The better adequacy of the newer version might be explained by its better verbal formulation.

The results of the confirmatory factor analysis also gave support to the expected factor structure, even if a theoretically pure model could not be received. The longitudinal data gave better results again; the error variances were, however, quite high. The results were received by setting the error variances of the variables free, which makes the interpretation of the results a bit more difficult. Also the fairly small sample size

weakened the reliability of the results; the effective sample size just exceeded the minimum to be demanded.

Although the influences of the level of education were not studied, it seems that a low level of education did not - at least in this case - decrease the results, as sometimes suspected; the results were in the same direction with Cordery & Sevastos's (1993) results. The possible variances of the factor structure might be explained by different target groups and research procedures in addition to the inaccuracy of the method.

The positive correlations between the core characteristics of job, the Work Motivation Potential (WMP), "growth" motivation and inner work motivation referred to the structural validity of the theoretical Job Characteristics Model (e.g. Hackman & Oldham, 1975; Turner & Lawrence, 1965), which the JDS is based on. The results were not, however, adequate for testifying the model; more specified analyses would be needed to estimate the interrelationships of the variables of the model.

The results gave support to the developers' views on the importance of the items *Feedback From Job* and *Autonomy* in calculating the WMP. These items were often loaded also on some other factors than those expected. Sashkin (1984) assumed that *Skill Variety* and *Feedback From Job* could form one factor. In this study this could not be shown by the factor analyses. On the other hand, it could be shown by path analyses (Supplementary Studies 1998 B, unpublished) that *Task Significance* had an impact on *Feedback From Job* (page 51); thus the items seemed to have a close connection with each other.

The Finnish versions of the JDS (Vartiainen, 1990) functioned quite well in the data used. The results were very good as for the fact that the questionnaires were mainly sent to the respondents by post against the recommendations concerning the method (Vartiainen, 1989). Certainly this was partly due to the procedures according to which the study was carried out in close co-operation with the personnel of the target organisations. The newer version seemed to function better as for the factor structure than the older one. On the other hand, the older version seemed to be more steady as to the Job Characteristics Model (JCM); the general influences by job.

A problem in connection with the collection of data was that it - with the exception of the first measurement of the comparison group two - was based on questioning by post. This meant that filling in the questionnaires could not be fully controlled. In the analyses of reliability, on the other hand, anything could not be shown which would arouse suspicions about filling in the questionnaires. Presumably those who replied did it fairly reliably.

Another problem with data collection was the fairly low rate of return (57%). One reason for that was surely the way of collecting data. Another reason for the loss was presumably the organisational change; this caused uncertainty among the workers because persons were moved from one organisation to another in this connection. Also a new supervisor's negative attitude towards the study influenced the loss in the measure-

ments two and three in one organisation: The workers were no more motivated or did not dare to fill in the questionnaires.

Important was the notion that the core characteristics did not separate especially well the development organisations from each other compared to those of the comparison group one, despite the fact that the occupational structure was about the same in both the groups. This does not tell about the separation ability of the JDS as such. If anything, it might give ground for additional discussions about the possible influence of a general factor due to the situation in the development organisations. Such a factor could be the expectation of a coming development process.

The reliability of the results also refers to the reliability of the data. If the data is unreliable, the measures do not give the right results, more likely, vice versa; a measure shown unreliable does not necessarily mean that the data is unreliable, too.

The procedures were based on the data of 15 independent organisations, which was a new and valuable point of view in general in the literature of the area. The findings supported the original hypotheses of the reliability of the method, as for both the reliability of the scales and the structural validity of the method. The results also supported the developers' (Hackman & Oldham, 1974, 1975; Hackman & Lawler, 1971; Turner & Lawrence, 1965) assumptions about the objectivity of the job characteristics.

The results indicate that the method seems to be relatively reliable and valid in this data. It seems that it is also usable when collecting data by post. In this case, however, special attention should be paid to the preparations of the project as happened in this study.

The Eigenzustand Method (EZ): New Support to the Theoretical Basis

The Finnish version of the EZ method with 39 items could be shown to be a reliable and valid method with a stable factor structure (Study II, originally published 1995). The expected factor structure was found by the confirmatory factor analysis. The reliability of the scales was fairly high and the dimensions of the method correlated strongly with the items of the JDS method. The highest theoretical level of the method *mental state* could also be proved by the confirmatory factor analysis and path analysis clarifying effects between organisational functioning, job characteristics and mental state (Study IV, originally published 1997).

In some studies (Apenburg, 1986; Kostama et al., 1992), doubts have been presented about the influence of personal factors on a person's perception of his or her emotions. It has been presented that perception is affected for example by personal expectations about the coming work day and the free time after the work day.

It is likely that many factors influence a worker's mental load in workplaces, not merely job characteristics themselves. This is the case especially when the question concerns a specific organisation; then it is likely that contextual and individual factors play an important role. The importance of these factors is diminished, however, by the fact that the data used consisted of different organisations separate from each other. In this kind of data the impacts of more or less permanent personal (e.g. Järvenpää, 1991) and special contextual factors (Järvenpää & Martinsuo, 1997), or the influence of the factors with the arrangement of work (Hahn, 1986), are not shown because of the use of averages.

In this data the construct validity of the EZ method seems to be fairly good as for the two highest hierarchical levels (motivation, mental strain). The reliability concerns both the theoretical structure itself and the stability of the structure. The expected factor structure was found on the two highest levels of the method. As a new thing, the factor structure was also confirmed by the confirmatory factor analysis, which has not - as known- happened earlier. The results by the confirmatory factor analysis supported the hypotheses about the hierarchy of the factor structure (Järvenpää, 1991; Kostama et al., 1992; Nitsch, 1971, 1976).

In addition to previous findings, the theoretical top-level concept of *mental state* could be shown by the confirmatory factor analysis (Study IV, originally published 1997). The factor structure was also found to be steady (Study II, originally published 1995). There was also evidence of the stability of the factor structure on the lowest hierarchical level; except the item *sleepiness*, the correlation coefficients of the dimensions were statistically significant in different measurements.

High correlations (Study IV, originally published 1997) with the core job characteristics of the JDS indicated that the EZ method really measures mental load connected with job characteristics; thus the results confirmed the criterion validity of the method. No doubt the method also functions as its own criterion in some sense: work load is measured both at the beginning and at the end of the work day. On the other hand, in this case it was not possible to compare the fluctuations of a person's perceived work load in any other circumstances than in the working environment.

The results gave support to previous findings about the fairly high reliability of the scales (Kostama et al., 1992). The consistency of the scales was comparable both with the Finnish and the international studies. So it seems that the EZ method is a reliable means for measuring mental work load.

The Finnish version of the method used consisted of 39 items. Thus the results did not confirm the criticism towards the method by some authors (Apenburg, 1986; Apenburg & Häcker, 1984); the results did not support the necessity of using a shorter version with 36 items (Apenburg & Häcker, 1984).

The data was collected mostly by postal questionnaires, which could have had an effect on the reliability of the replies compared with the controlled filling in of questionnaires in the actual workplaces. Used in this way, however, the method seems to be fairly

reliable as for the measurements and the structural validity. Careful preparation for the procedures may have been one reason for good results (Study I, originally published 1994).

As a whole, the method seems to suit quite well for measuring short-term mental work load. Being fairly easy to use, the method can be used for the evaluation and follow-up of mental work load of the personnel and the effects of development procedures in different organisations. A problem has generally been that the effects of development procedures have not systematically been examined. The evident suitability of the method for postal questioning increases its usefulness as a tool of measuring working conditions. However, a necessary precondition of this is that preparations are carried out carefully.

As for further development, a shorter version of the method, for example with 36 items, could also be experimented in Finland (Apenburg, 1986; Kostama et al. 1992). There was evidence of the stability of the lowest level of the hierarchy. This should also be clarified by the confirmatory factor analysis in connection with the development of a new version of the method.

Organisational Self-Improvement Possible on Certain Preconditions

The results showed that an organisation can develop its working environment on specific conditions. The arguments below - except the last one- were based on the results of development processes in the development organisations (K1-K3) followed by the author (Study III, originally published 1996). The last argument was based on the results of the studies (Study IV, originally published 1997; Supplementary Studies 1998 A, unpublished) by path analysis, according to which a worker's mental state influenced his or her *Sense of Competence for Development* (pages 34 and 36). When a worker felt mentally less strained, his or her self-esteem was higher than in the opposite case. Organisational self-improvement was seen to be possible especially when

- the organisation is small
- the organisation is located at one place
- the organisation is properly functioning - the co-operation between the supervisors and the subordinates as well as the co-operation between the workers, functioning of the occupational safety and health staff and the participation are good enough
- the rate of organisational change is moderate (controllable)
- the foreman is capable of organising; he or she is motivated, takes the leadership and responsibility for development

- the development group is functioning (its composition and working habits are flexible and active; it is correctly appointed = representative and trusted by the personnel)
- the development method is proper including the possibility of feedback from the development of organisational functioning during the process (like the method used).
- mental well-being is good enough, because it contributes to the *Sense of Competence for Development*.

There are different opinions of the way in which a development process should be started and carried out. Many researchers consider the role of leadership and the participation of workers as the most important. The results supported these assumptions; the role of leadership connected with co-operation was emphasised.

By using the method of organisational self-improvement it was shown to be possible to start a development process in an organisation. Although the role of leadership seems to be important in a development process, as many authors argue (e.g. Ansoff & Brandenburg, 1971; Argyris, 1985; Miller & Droge, 1986), the need for a development process can also be initiated by other parties unlike Argyris's (1985) arguments.

It is likely, as Miller & Droge (1986) considered, that the role of leadership is important in shaping the organisational culture - the way people are behaving in a workplace. It is also evident, as Weisbord (1978) emphasised, that the role of leadership is central in organisational functioning and development. It can also be supposed like Ansoff & Brandenburg (1971) that the role of leadership is important in a decision process. The decisions should, however, be made in co-operation with the personnel, as Naschold (1993) stressed.

The results gave support to the assumptions that participation is an important element in a development process (e.g. Harrison, 1985; Hinckley, 1985; Lindström, 1994b; Murto, 1992;). The results did not, however, give full support to the assumptions (e.g. Murphy, 1992) that the members of an organisation are the best experts in all cases. There is also an evident need for outside expertise in certain situations (Wilson, 1994) especially when the resources of an organisation are not great enough to carry out the development process. This is evidently the case when the leader of the organisation is not willing or capable of organising the development process or the process is not under control (Study III, originally published 1996).

There are numerous techniques of organisational development. Most of them are based on the use of outside experts in a development process (e.g. Bandura, 1986; Engeström, 1995; Lindström, 1994b; Schein, 1993; Murto, 1992). *Process consulting* in some form is the method of development in a great number of development processes. This means that an outside expert is used in the development process in co-operation with the personnel. An other orientation is offered by the analytical working method used

by outside researchers who do not participate in the actual development process (Saarela, 1991). Some authors have studied organisational self-improvement recently (e.g. Cummings & Mohrman, 1987; Leoford & Mohrman, 1993; Study III, originally published 1996).

It could be shown in the study that the perception of the organisational functioning of the personnel can be improved by a quantitative research method without an outside expert; it was also shown that the perception of mental work load can be decreased by the method used.

It seems that the mental well-being of personnel can best be improved by a leadership style which takes care of people in practice. The results of this study supported Leoford & Mohrman's (1993) self-design model; the study was constructed so that the organisations were offered no special model for the development process at the beginning of the intervention. The organisations did not use any special outside model either, nor any specialists, although they were offered an opportunity for it. The method used resembled Leoford & Mohrman's (1993) model also in such a way that the development groups took care of the procedures, laying the foundation (acquired knowledge, valued and diagnosed), designing, implementing and assessing.

The model used in this study differed from that of Leoford & Mohrman's (1993) in such a way that it was applied to small (not complex) organisations and the necessary feedback from the development of organisational functioning was given by the author to the development groups. The author himself did not participate in the functions of the organisations in any other way; the approach was partly similar to an outside expert's analytical way of working mentioned by Saarela (1991). So the model was not a self-design model in the full meaning. In the development process there were also features of self-organising principles described by Kaplan & Kaplan (1991); the structures of the process were developed in connection with the activities.

Workers' ability to act - as an expression of mental work load - seemed to increase in the development organisations (K1-K3) during the follow-up. This might have connections with the development, although this could not be conclusively showed. As for the personnel's ability to act, the results gave cues to the usefulness of the development model. The method used was more strength sparing compared to that of learning by expanding (Engeström, 1995), and more recommendable in this respect.

The concept of *organisational functioning* has had different meanings. The definition of organisational functioning has, among other things, included health aspects (e.g. Cooper & Cartwright, 1994; Study III, originally published 1996). The results showed that organisational functioning can be improved in the sense meant in the study. Organisations did not, however, succeed in this in every respect, which may also explain changes in the perception of work load. It has to be noticed that the organisations - even if they were motivated to develop their working conditions - did not carry out the proposed development model literally but approached things according to their own models.

The results supported Weisboard's (1978) assumption that in addition to leadership also the supportive structures of an organisation are important for the workers' well-being. The results also supported the assumption of the ability of the personnel in an organisation to develop their working conditions themselves on specific conditions.

It is evident that instead of using the concept of functioning, it would have been possible to use the concept of efficiency like Kilman & Herden (1976). By (inner) organisational efficiency they meant human relationships, motivation and commitment; group processes were included in the concept, too. Although the results (Study III, originally published 1996) were due to the quantitative approach, it is evident that the actions to be needed in the organisations were based on co-operation and human relationships among the personnel. This is in congruence for example with Schein's (1993) arguments. He stressed that organisational efficiency is connected with organisational culture, which in turn depends on leadership style and communication between different sub-cultures. He considered (1993) *dialogue* as the central method in organisational change and emphasised that all the groups with an aim to solve problems should start the process by dialogue. As for a learning process, he stressed the importance of a common model. It was interesting to find that the processes necessary for development could be brought about without intervening in the process itself, as Schein presumes.

The course of action in this study (Study III, originally published 1996) was designed to be based on the feedback from the development of the worker's mental well-being. The results supported Naschhold's (1993) assumptions about the nature of organisations. He argued that organisations are not black boxes, the efficiency and the quality of which are defined mechanically by technology, education or other input factors applied by other organisations. He stressed the importance of the inner factors of an organisation for development, e.g. co-operation between the management and the personnel.

The results of this study gave a new approach to Schneider's (1987) arguments about workers' functioning at a workplace. The basic idea, according to him, is the suitability of a person to a certain environment, which functions in its own way. Schneider examined human functioning in the context of human environment: People do workplaces the kind they are. He used the *attraction - selection - attrition (ASA)* model $[E=f(P,B)]^1$ to describe how people are interested in workplaces and selected by them, and how they leave them. The model, however, seems to be a bit too simple, which can be seen in the rationale below.

An interesting question to be answered is: Why do people who have been interested in a workplace and who have been selected by the personnel of an organisation, however, want to leave the place fairly soon after they have come to it? This might happen because the environment (physical or psychosocial) *is or has become* unbearable for

¹ E (environment) = f (function) of P (persons) and B (behaviour)

them due to mental work load. Why, then, do people not reorganise their working conditions more suitable to them? Perhaps because of their inner structural factors. Their mental models may be unsuitable; they may be lacking the Sense of Competence for Development for a change to be realised. It might also happen because people's mental models are contradictory to each other as Marshak (1993) has presented.

On the other hand, it may be that the elected person or the other people who have selected him or her do not want to leave the workplace even if they suffer from the working conditions. Why? Perhaps because there is no other change of taking another workplace. So it seems that also structural factors, not only people's functioning, influence a worker's behaviour at a workplace.

In the light of the results it appears that the method used is useful or at least worth studying and developing. The usability concerns especially organisations where the leadership is in order and the project group is responsible for development, and it is functioning properly. When the project group works, it is assembled in the right way, in other words, it is adaptable and representative as for the matters to be handled and it is trusted by the personnel. The representatives of both genders should be included in the project group.

As for a successful development process, it might also be useful to have different kind of education and working life experience in the group. The target organisation should be specified, in other words, to be in a special place and form a functional unity. A clear model for development procedures and good planning may be helpful tools in the development process. Also adequate follow-up time (over one year) is needed for evaluating the permanence of the effects.

Respectively, the model cannot be recommended to be used in organisations where leadership is totally missing or does not function well. Neither can it, in general, be recommended in situations where the personnel is put in front of overwhelming tasks, like reorganisation, as to their capacities. In this case people need an outside expert's assistance and special measures of support from occupational health care.

A new thing in this study was to notice that organisational functioning influenced the workers' mental well-being (Study IV, originally published 1997), and it was not merely a sign of a healthy organisation (e.g. Cooper & Cartwright, 1994). Better functioning was connected to better mental well-being, and vice versa. A new thing was also the notion that organisational functioning influenced a worker's *Sense of Competence for Development* via experienced work load - mental state. Better functioning was in connection with better mental well-being; this in turn was connected to a higher self-esteem and via that to a greater willingness to develop working conditions, and vice versa. The study of the effects was made in the material of seven separate organisations. This means that the effects can be generalised, representing the effects of the general principles of human functioning. A new thing was also that more specified conditions for

self-development process could be found. For the future research it would be interesting to study the duration of the effects shown during a longer time than what happened now.

The results, with some exceptions, can be generalised at least to concern the blue-collar organisations of the public sector. The method used may prove to be useful in the self-improvement projects of organisations. The occupational safety and health authorities may also utilise the results in their supervisory work. The results help them to evaluate more properly when an organisation can succeed itself in the development process and when there is need for outside expertise. In further studies, the different methods of development could be compared with each other more systematically and their influence on organisational functioning and the mental work load of personnel could be studied. It could also be useful to study the role of planning in the development work.

The Objective Working Environment and Worker's Perception

In this study the results of the path analyses (Study IV, originally published 1997) indicated that factors related to the organisational functioning and the characteristics of work influenced a worker's mental well-being. A better working environment was in connection with greater well-being, and vice versa. The study was based on the data of seven organisations independent of each other.

A Structural Perspective

In the psychological literature there has been a discussion about the impact of the objective environment on the perception of environment and about its consequences on one's health. Many authors have considered the objective working environment as a source of the personal consequences of work load (French & Caplan, 1972; Gardell, 1982; Hackman & Oldham, 1975; Hänsen et al., 1995; Karasek & Theorell, 1990; Lazarus, 1993; Turner & Lawrence, 1965; Varonen, 1997). In the light of the results (Study IV, originally published 1997), it is obvious that the objective working environment influences human behaviour and a worker's mental well-being in a way that is typical of the general principles of human behaviour.

A Contextual Approach

The importance of contextual factors in the perception of working environment has been emphasised in many studies (e.g. Fried & Ferris, 1987; Järvenpää & Martinsuo, 1997;

Westlander, 1993). Some authors have considered social factors as important to influencing one's perception of working environment and work stress. According to the Social Information Processing Theory (SIP), social cues influence a worker's perception of working environment and work itself (e.g. Algera, 1990; Fried & Ferris, 1987; Costigan, 1996). In this study (Study IV, originally published 1997) the influence of specific contextual factors was not shown due to procedures based on the averages. So evidence about the importance of these factors could not be shown. This does not, however, mean that there could not be such effects.

There is also a lot of literature on the meaning of social support in the regulation of work stress (e.g. Amatea & Fong, 1991; Deci & Ryan, 1991; Helminen, 1998; House, 1981; Kalimo, 1980; Karasek & Theorell, 1990; Vahtera, 1993). The results (Study III, originally published 1996; Study IV, originally published 1997) gave indirect support to these findings: co-operation was found to be important in regulating workers' work load. On the basis of the results it seems that the discussion about the importance of contextual factors as moderators of the perception of working environment and stress reactions should be further studied according to the principles of general human behaviour.

An Individual Viewpoint

In organisational psychology there is an old and strong traditional way of thinking which emphasises the importance of individual personal factors in a stress process. For example Levi (e.g. 1971, 1994), though he saw the origin of stress in a psychosocial process, emphasised the consequences of stress as personal characteristics. Kahn (1981) presented that the permanent characteristics of a person (genetic, demographic, personality) are seen as factors influencing the phases which precede one's psychological environment, responses (physiological, behavioural, affective) and mental and physical health and disease.

Some authors (Murphy, 1996; Murphy et al., 1995), however, have criticised this orientation. Murphy (1996) stated that stress-coping programmes have in the USA been too much individually orientated. The results (Study IV, originally published 1997) showed that individual factors do not explain all the variation.

In the trait model (e.g. Epstein, 1983) self-esteem has been seen nearly as an endogenous personal trait, which influences the experience of stress (see also Saari & Majander, 1985). Support to this assumption could not be found, rather on the contrary: self-esteem was found to be influenced by mental work load. A heavier mental work load was in connection with a lower self-esteem, and vice versa.

Because of the data based on linear relationships and averages, it could not be shown either that individual characteristics would influence the perception of work load. Algera (1990) suspected that there was a possibility of a methodological bias of the JDS

due to the fact that it is the one and the same person who perceives both job characteristics and the other workers' behaviour. Levin & Stokes (1989) argued that negative affectivity (NG) influenced one's task satisfaction and that it was a remarkable predictor of a person's perception, also when job characteristics were taken into consideration. Schonfeld (1996) argued that negative affectivity did not fully explain the influence of perceived environmental factors on depressive symptoms, job satisfaction and motivation. Schaubroeck et al. (1996) presented that there was little evidence of the influence of personal factors on the stability of perceived job characteristics measured by the JDS. Also Spangler (1989) assumed that specific personal features had minimal effects on the perception of job characteristics.

An Intermediary Point of View

There is perhaps even a wider scientific tradition according to which personal factors are seen as mediators or regulators in perceiving environmental factors and stress reactions (e.g. Bandura, 1986; Cox, 1993; French et al., 1974; French & Caplan, 1972; Schwartz et al., 1996). Kivimäki (1996) suggested that personal factors can be both stress and stress-specific factors. The findings of this study (Study IV, originally published 1997) supported this approach, but on a general level. The importance of general factors typical of human behaviour were shown: factors that are independent of a single person's individual characteristics or the specific features of an organisation. It can be supposed that these influences are in close connection with the objective environment. This does not, however, mean that there would not be any specific intermediary or regulatory contextual or personal influences mentioned in the literature. Anyway this means that the discussion about the meaning of personal factors as the main causes of work stress (e.g. Epstein, 1983; Levi, 1972, 1994; Levin & Stokes, 1989; Locke, 1976) should be studied in a new light.

Some authors have emphasised cognitive factors (e.g. Lazarus, 1962; Neisser, 1982) as regulators between a person's perception of the objective working environment and work stress. Evidence was found (Study IV, originally published 1997; Supplementary studies 1998, unpublished) of the importance of these factors to the perception of working environment. Hacker (1982, 1985) used the concept of mental model when speaking about these factors. He (1982) argued that the better one's cognitive models represented the objective environment, the more fluent his or her task performance was. This was not studied in this study but evidence was received of the importance of such a cognitive factor as the *Sense of Competence for Development* (Supplementary Studies 1998 A, unpublished) to the perception of job characteristics. The findings (Study IV, originally published 1997) about the influence of perceived emotional work load on the variables of this factor may be in connection with the goodness of mental models: The

more involved in stress a worker is, the more inadequate his or her mental model is, and the more difficult it may be for the person to perceive job characteristics objectively.

The results gave support to Bandura's (e.g. 1988, 1989, 1990b) arguments about the importance of self-efficacy as a regulator of behaviour. He presented that self-efficacy influences one's performance via cognitive, motivational, affective and selection processes. Self-efficacy itself - according to him - is affected by the feelings of mastery, modelling, social influence and physical fitness. He defended (1995) his ideas against behavioristic arguments by stating that behaviour is often influenced by other things than the factors of immediate state. It was shown on a general level (Study IV, originally published 1997) that a person's self-esteem was influenced by his or her perceived work load due to the objective characteristics of work (e.g. Task Identity and Autonomy). This in turn influenced one's motivation for development. Better job characteristics were in connection with better mental well-being and a higher self-esteem, and vice versa.

The results of this study (Study IV, originally published 1997; Supplementary Studies 1998 C, unpublished;) were in accordance with Keskinen's (1990) findings as for the interrelationships between job characteristics, job satisfaction, mental well-being and mental models. Keskinen (1990) found that the development of a worker's mental model was in connection with a high job satisfaction and low job strain only when the worker was generally mentally well or his or her professional identity was high enough and the person perceived to have enough possibilities to influence the working environment.

It was found that mental well-being influenced the defined cognitions (self-esteem and willingness to develop working conditions), which were supposedly connected with one's mental models i.e., the way the person perceives his or her environment. Better mental well-being was connected to a higher self-esteem and a greater willingness to develop working conditions, and vice versa.

Keskinen's findings (1990) about the factors influencing one's mental models may be explained by the intervening role of emotions (e.g. arousal level): the more exhausted (confused) a person is, the more difficult it may be for him or her to form an adequate model for managing in the environment. The results of this study (Study IV, originally published 1997; Supplementary Studies 1998 C, unpublished) supported Keskinen's findings (1990) that one's job satisfaction and perception of work load were regulated by personal well-being and organisational functioning.

Recently, studies have been made about the influence of organisational factors on a person's job satisfaction (e.g. Ting, 1997) using very large samples. Ting (1997) found for example that such job characteristics as task clarity, Task Significance and skills utilisation had an impact on job satisfaction. The clearer and the more significant the work was when perceived by workers, and the more skills the workers could use in their job, the more satisfied they felt, and vice versa. Also the better workers perceived the relationships with the supervisor and between co-workers, the more satisfied they felt,

and vice versa. These kinds of research models are important and encourage to develop workplaces to become more humane, healthier and also more productive.

The results (Study IV, originally published 1997) were in accordance with findings (e.g. Amatea & Fong, 1991; Angyal, 1941; Antonowsky, 1979, 1987; Karasek, 1979; Vahtera, 1993) about the importance of perceived control over one's work. Angyal (1941) argued that the general dynamic trend of an organism is towards increased autonomy. It was found (Study IV, originally published 1997) that job characteristics like Autonomy and Task Identity influenced one's perception of work load. The more autonomous the work was when perceived by workers, the more willing they were to develop their working conditions and the more capable of acting they felt in their jobs. The clearer whole the work was perceived to constitute by workers, the more able to act they felt in their jobs and vice versa (page 34).

Antonowsky (1979, 1987) used the concept of the *Sense of Coherence*. By this he meant comprehensibility, manageability and meaningfulness; that things are in order, controllable and predictable. Karasek's (Karasek, 1979; Karasek & Theorell, 1990) stress concept was based on the Demand/Control Model (DCM) and the Expanded Demand/Control Model (DCSM). Karasek (e.g. 1979) argued that high job demands and a low decision latitude were related to one's poor health status.

The Influence of Organisational Functioning on a Worker's Mental Well-Being

It could be shown in the study (Study IV, originally published 1997) that the perception of organisational functioning (co-operation between the supervisors and subordinates and among the workers, functioning of occupational safety and health staff and possibilities of participation) influenced a person's perceived mental state (motivation and mental strain). Better organisational functioning was in connection with greater mental well-being, and vice versa. The perception of good organisational functioning was characterised by participatory leadership, social support between workers, consideration of mental aspects in the functioning of the occupational safety and health staff, and by workers' real possibilities to influence matters in the organisation (Study III, originally published 1996).

In the light of the literature in the area and the results of the study, it seems evident that organisational functioning defined by the author is in connection with the social process of an organisation. Functioning has been considered to be a sign of a healthy organisation (Study III, originally published 1996; Lindström, 1994b.). Kivimäki & Lindström (1994) and the author (Studies III and IV, originally published 1996 and 1997) have presented that participation is connected with perceived organisational functioning.

Karasek's (Karasek & Theorell, 1990) view about the importance of the role of social support in the regulation and the prevention of stress was shown to be noteworthy (Study IV, originally published 1997); co-operation, no doubt, includes elements of social support. The results showed (page 34) that a better co-operation between supervisors and subordinates was connected with a greater job satisfaction and a lower mental work load (mental strain), and vice versa. A better co-operation between supervisors and subordinates was also in connection with the perception of a better co-operation between workers, and vice versa. It was also shown (page 41) that a better collaboration was in connection with the lower rate of sick days in an organisation. The fact that the functioning of occupational safety and health staff was perceived as positive when workers' mental aspects were taken into consideration told clearly about people's mental work load, the pressure for change perceived by the personnel, and the necessity of developing working conditions in this respect (Study III, originally published 1996).

The Role of Leadership

The results supported the assumptions included in the so called NIOSH² model (Murphy & Lim, 1997). According to Murphy & Lim (1997) organisational values, climate and leadership practices influence organisational health and performance. They considered as an important organisational value the manager's way of treating a worker as a valuable human resource. They considered workers' opportunities for decision to make as a sign of good organisational climate. They argued that the characteristics of a preferable management style was supporting workers and giving recourses to them for the planning of future.

The findings of this study were also in congruence with Immonen's results (1993) about the decrease of workers' work load when the manager was perceived to be "available", when needed. Immonen (1993) found that workers' perception that the manager likely had time to listen to them decreased their feelings of mental work load. She also found that satisfaction with the manager correlated to some extent with interaction with the manager.

There is a lot of literature on the positive influences of participation on workers' job satisfaction, mental well-being, organisational development and even their free time (e.g. Gardell, 1982; Israel et al., 1989; Murphy & Lim., 1997; Kivimäki & Lindström, 1994; Saarela, 1991). The results of the study (Studies III and IV, originally published 1996, 1997) supported these findings. Participation was perceived to be good when workers perceived that they could influence things concerning the working conditions.

² National Institute for Occupational Safety and Health (USA)

The findings supported the notion of Israel et al. (1989) that the perception of influence was a consequence of participation.

Collaboration and Social Support

The findings of this study (Study IV, originally published 1997) on the influence of co-operation on workers' mental well-being supported many of the findings (e.g. Cohen & Wills, 1985; Dooley et al., 1987; Lindström, 1997) described in the literature of the area. It was found (Study III, originally published 1996) that collaboration between workers was considered to be good when workers received and gave social support to each other.

Co-operation among the personnel has been seen as a social process, which either includes or does not include an opportunity for receiving support in daily work processes. Cohen & Wills (1985) and Dooley et al. (1987) argued that better social integration and satisfying social relationships were connected to better mental well-being, and vice versa. Lindström (1997) assumed that good social co-operation and interaction were related to workers' good job satisfaction and well-being. He also presented that good opportunities for participation as well as the manager's positive attitudes towards the personnel were connected to the high well-being of the personnel. Deci & Ryan (1991) assumed that social support was an interaction process, which depended much on the receiver's personality.

The findings of this study supported many other authors' arguments that an opportunity for social support decreased one's mental strain or sickness (e.g. Amatea & Fong, 1991; Kalimo, 1980; Karasek & Theorell, 1990; Revicki & Gershon, 1996; Theorell & Karasek, 1996). House (1981) categorised social support in four categories: emotional, instrumental, informative and appreciation. It seems natural to suppose that at least an opportunity for social support of all these forms was included in co-operation.

The Importance of Structural Factors

Some authors have considered the structural characteristics of an organisation important to the health and functioning of an organisation (e.g. Cooper & Davidson, 1987; Dean & Hancock, 1992; Kalimo, 1994; Weisboard, 1978; Varonen, 1997). The results of the study (Studies III, IV, originally published 1996, 1997) supported these assumptions.

The results of this study (Study IV, originally published 1997) supported Weisboard's (1978) and Kalimo's (1994) arguments about the importance of the structural and environmental factors to the health of personnel. The results supported Weisboard's (1978) assumptions about the importance of the supportive structural characteristics of an organisation such like occupational safety and health. An interesting new thing was to

notice that the functioning of occupational safety and health staff influenced a person's mental well-being despite of specific individual or organisational factors. Better functioning of occupational safety and health staff was related to better well-being of the personnel. The expected corresponding effects of occupational health care were not, however, found in this study.

The results were in accordance with Kalimo's (1994) opinions about the influence of working conditions on both workers' health resources and the actual health. According to Kalimo, a remarkable part of occupational safety and health in Finland has been protection of health against environmental hazards. Dean & Hancock (1992) used the concept of *health protection*, which - according to the author - included work safety and ergonomic improvements in the working environment.

The findings of this study were also in accordance with Varonen's (1997) results. He argued that the objective safety level of the working environment influenced the workers' perception of the safety level and the style of safety management in an organisation. A better objective safety level was also better perceived by workers. This was connected to the perception of a better management style in an organisation, and vice versa. This finding supports many of the results of the previous studies: the importance of the objective environment to a worker's health.

In general, a new thing in this study (Study IV, originally published 1997) was the finding that the factor of organisational functioning based on empirical data could be constructed. A new thing was also that it could be shown that *organisational functioning* - measured by the defined items - influenced workers' mental well-being despite of the influence of specific organisational or personal factors. Better functioning was related to better mental well-being (lower mental work load), and vice versa. It could also be shown (Study III, originally published 1996) that the factors of organisational functioning were in connection with mental strain in the longitudinal data. Better functioning was related to a better ability to act, and vice versa.

Short Term Mental Work Load and Self-Esteem

It was found (Study IV, originally published 1997) that mental strain (ability to act) influenced self-esteem. A better ability to act was related to a greater self-esteem, and vice versa. The influence of self-esteem on mental strain was mediated by organisational development motivation and organisational functioning. A greater self-esteem was in connection with a greater willingness to develop working conditions, a better collaboration between workers and better opportunities for participation, and vice versa. Mental strain had bi-directional influences on (emotional) motivation; both were measured by the EZ method. A lower mental strain was in connection with a higher motivation, and vice versa.

The results were in accordance with the theoretical framework according to which self-esteem can be influenced by external factors after adolescence (e.g. Argyris, 1964; Gergen, 1971; Kernis et al., 1989) and - based on this point of view - with the arguments that self-esteem is influenced by work stress (e.g. French & Caplan, 1972; Kauppinen-Toropainen, 1987; Kivimäki, 1996). The results supported Kivimäki's arguments that heavy stress can decrease a person's self-esteem (Kivimäki, 1996; Kivimäki & Kalimo, 1996). This may be explained - according to Kivimäki and Kalimo (1996) - by the fact that when one feels his or her energy exhausting, one interprets the perception due to personal characteristics like skills instead of rating the safety and health of the working conditions in general. An interesting new thing was the finding that also heavy short-term mental work load (in this case the decrease of *ability to act*) lowered workers' self-esteem.

Depression connected to a heavy work load can also explain the found influence of ability to act (work load) on workers' self-esteem (Study IV, originally published 1997). This kind of findings have also been made in clinical practice³ with psychiatric clients; depression is often found to be connected with heavy exhaustion. Of course, depression may also be influenced by other stress factors outside work.

Besides a person's interpretations concerning organisational functioning (co-operation between the workers and the opportunities for participation), self-esteem also influenced one's motivation to develop working conditions and via this the perceived mental state. A greater self-esteem was related to a greater willingness to develop working conditions and to a lower mental strain, and vice versa. The last finding partly supports Bandura's conception of the increasing or decreasing influence of perceived self-efficacy on motivation (Bandura, 1991).

A new thing was the finding that the influence of self-esteem on mental strain was mediated besides by motivation (willingness to develop working conditions), also via the perception of organisational functioning (see the section above). This was likely to be explained by a rationale that when a person believed to succeed poorly with his or her tasks (low self-esteem), he or she desired to get help from co-workers but did not perceive to get it enough. The person also perceived the opportunities for participation to be poor, because he or she did not feel to be able to influence the working conditions properly. Because of this, perhaps, the person's motivation for development was poor too. All this presumably influenced bi-directionally but not directly the perception of *ability to act*. Thus the results of this study did not support the assumptions about the direct influence of self-esteem on the perception of stress (e.g. Epstein, 1983; Saari & Majander, 1985).

Arguments about bi-directional influences have also been presented (e.g. Bandura, 1986; Kivimäki & Kalimo, 1996). Rector & Roger (1996) presumed that self-esteem may

³ The observations are based on the author's clinical work

moderate well-being directly as well as indirectly via coping styles and emotion control strategies. The results (Study IV, originally published 1997) supported these assumptions: self-esteem influenced both the perception of organisational functioning and the willingness to develop working conditions. A greater self-esteem was in relation with greater functioning and willingness to develop working conditions, and vice versa. The results also gave partly support to Bandura's assumption (e.g. Bandura, 1989, 1990a) that self-efficacy has an impact on motivation. In this study the influence was direct on development motivation and indirect on emotional motivation (mental work load), see the discussion above. In general, the results gave support to assumptions about the meaning of work stress to personal factors, of which the role of self-esteem and motivation are of crucial importance. Work stress seems to decrease a worker's personal resources to cope with challenges in the working environment.

Job Characteristics and Mental Well-Being

The effects of perceived job characteristics (Skill Variety, Task Significance and Autonomy) on workers' mental well-being could be shown. Work improved the mental state of personnel when it was perceived to give the workers opportunities to use their skills and to learn new things (Study IV, originally published 1997). The influence was of the same kind when work was perceived as significant as for other people and when the way of working could be influenced. It could also be shown (Study IV, originally published 1997) that *Task Identity* had a direct impact on workers' mental strain (ability to act), whereas *Autonomy* influenced one's ability to act via willingness to develop working conditions. A better conception of one's tasks as an entity was related to a greater ability to act, and vice versa. A better opportunity for influencing one's way of working was also related to a better ability to act, but via a greater willingness to develop working conditions, and vice versa. The ability to act influenced self-esteem, which in turn had an impact on mental strain via willingness to develop working conditions (page 34).

The findings of this study (Study IV, originally published 1997) supported assumptions about the influence of the objective job characteristics on workers' mental well-being (e.g. Hänsen et al., 1995; Hackman & Lawler, 1971; Hackman & Oldham, 1974, 1975; Turner & Lawrence, 1965). According to these assumptions, better job characteristics increase and poor ones decrease workers' mental well-being. The influence was shown without any special individual or contextual factors (see the previous discussion). There was, however, evidence of the possibility of some kind of collective cognitive mental models - typical of the human being - for perceiving environmental factors like job characteristics. In this respect the results (Supplementary Studies 1998 A, unpublished) differed from the original hypotheses.

It seems that work should be perceived as autonomous enough to cause development motivation in general. Thus the results supported the assumptions of the developers of the JCM model and the JDS method (Hackman & Lawler, 1971; Hackman & Oldham, 1974, 1975; Turner & Lawrence, 1965) about the increasing or decreasing influence of job characteristics on a worker's motivation. The results also gave support to the assumptions presented by Renn & Vandenberg (1995) about the enhancing or diminishing role of the perception of influence in one's motivation and work performance. They assumed that the experience of high influence increased motivation, which, in turn, increased job performance. They also assumed that the perception of competence was based on the feed-back of high performance. The results also supported the conception presented by Johansson & Gardell (1988) of the generally activating influence of good job characteristics.

Both *Task Identity* and *Autonomy* were connected to the control of work. In this respect the results supported the stress model (DCSM) presented by Karasek (Karasek & Theorell, 1990) and many other authors, according to which the possibilities to influence the way of working (the control of work) decrease one's work stress, even if the work is demanding (Karasek & Theorell, 1990). The results could not, however, diminish the possibility of the cumulative effects of stress presented by some critics (e.g. Baker, 1985; Kasl, 1996) of the Karasek's model. Nor could the assumptions (e.g. Fried & Ferris, 1987) be excluded about the influence of special contextual factors due to the data based on the averages and the linear relationships between variables.

Greater *Autonomy* perceived by men compared with women could be explained by different kinds of tasks; the result was not explained by self-esteem. Evidently women worked with more traditional tasks, which included less opportunities for influence than men's work. The results of the relationships of occupational education with a better motivation and the ability to act were in accordance with Huhtaniemi's (1995) studies.

An interesting and important thing was the notion that the structural factors of working environment, like job characteristics influenced workers' emotions and cognitions in a way that is of crucial importance to their performance. This is a supplementary opinion to Kaplan & Kaplan's (1991) ideas, who presented that there are no structures without processes and that processes form structures to be needed. This assumption was shown to be true in the organisational development processes (Study III, originally published 1996): The organisations chose their own ways (structures) of functioning.

The finding on the influence of structures on processes opens new ways of thinking in organisational development: processes can be influenced and changed by influencing structures. Environmental structures better adapted to human being increase workers' mental well-being and their personal resources to meet the demands of work and working environment, and vice versa. This means that by paying attention to structural, objective factors and changing them working conditions can be made healthier for workers.

Job Satisfaction as an Expression of Organisational Functioning

It was found (Supplementary Studies 1998 C, unpublished) that co-operation between supervisors and subordinates influenced workers' job satisfaction and this, in turn, their mental well-being. The better the co-operation was, the greater the perceived job satisfaction and mental well-being were, and vice versa.

The perception of the possibilities of participation was in positive connection with the perception of the functioning of occupational safety and health staff. This, in turn, was in a positive relation to the perception of co-operation between supervisors and subordinates. The results were in accordance with the expectations about the interrelationships between the variables of organisational functioning and job satisfaction. The interrelationships were, however, more complicated than what was expected.

The findings of this study (Supplementary Studies 1998 C, unpublished) supported Turner & Lawrence's (1965) assumptions about the impact of environmental factors like leadership and job characteristics on a worker's job satisfaction. The JCM model developed by the authors (Turner & Lawrence, 1965) was based on the assumptions that a better leadership style and better objective job characteristics are related to a higher job satisfaction via individual factors, and vice versa. The results were also in congruence with the results of Ting (1997), according to which better relationships between supervisors and co-workers were connected to a higher job satisfaction. Ting (1997) found for example that a better task clarity, Task Significance, the utilisation of skills, organisational commitment and relationships with supervisors and co-workers were in connection with a higher job satisfaction, and vice versa.

The results supported also the arguments of Munn et al. (1996) about the importance of supervisory support to job satisfaction. The authors (Munn et al., 1996) found that role ambiguity was in connection with increased burnout and job dissatisfaction, and the lack of supervisory support was connected to a lower job satisfaction. In this study (Supplementary Studies 1998 C, unpublished) a better co-operation between supervisors and subordinates was related to a greater job satisfaction. It is likely that co-operation between supervisors and subordinates includes an opportunity for a kind of social support.

The results (Study IV, originally published 1997; Supplementary Studies 1998 C, unpublished) supported the findings of Israel et al. (1989) about the mediating role of job satisfaction as to the impacts of participation. Israel et al. found (1989) that the impacts of participation were almost entirely mediated via job satisfaction and the perception of influence was dependent on participation. In this study (Supplementary Studies 1998 C, unpublished), a new thing was the notion that the influence of participation on job satisfaction was mediated via the other factors of organisational functioning like co-operation between supervisors and subordinates. Co-operation between supervisors and subordinates, in turn, was influenced indirectly by participation via the functioning of

occupational safety and health staff. Better opportunities for participation were related to the better functioning of occupational safety and health staff and a better co-operation between supervisors and subordinates. This might perhaps be explained by the fact that participation itself does not contribute to the perception of co-operation. The perception arises only when a worker sees that something is really happening due to participation - in this case as a result of the functioning of occupational safety and health staff.

The results of this study (Supplementary Studies 1998 C, unpublished) supported the findings of Parker et al. (1997) about the association of participation with mental well-being. They found (1997) that increased role clarity, control and participation were associated with improved mental well-being. The interrelationships between participation and mental well-being were though more complicated - as described above - than what Parker et al. (1997) found.

The results of this study (Study IV, originally published 1997; Supplementary Studies 1998 B, unpublished) supported partly Kauppinen-Toropainen's (1987) findings about the influence of self-esteem on women's job satisfaction. The author (Kauppinen-Toropainen, 1987) found that women's higher self-esteem was connected to their greater job satisfaction. According to the findings of this study, self-esteem did not influence job satisfaction directly but via willingness to develop working conditions. A greater self-esteem was connected to a greater willingness to develop working conditions and by it to a greater job satisfaction, and vice versa. An explanation for this might be that a person's self-esteem is connected with his or her *competence motivation* (see the next chapter), and this causes the sense of job satisfaction.

The results did not give support to Nowack's (1991) findings of the impact of *cognitive hardiness* - a kind of analogue of self-esteem - on job satisfaction via perceived amount of work stress. The interrelationships of self-esteem, work stress and job satisfaction seem to be more complicated. According to the findings of this study (Study IV, originally published 1997; Supplementary Studies 1998 C, unpublished), it is the perceived mental strain that influences a person's self-esteem and this, as described above, has an impact on job satisfaction via motivational factors. The possible impacts of self-esteem on mental strain seem to be mediated via factors of organisational functioning and job satisfaction.

The Sense of Competence for Development (SCD) as a Mediator

The two-factor structure of SCD (self-esteem and willingness to develop working conditions) and Job meaningfulness (Skill Variety, Task Significance, Feedback From Job) was found (page 36) in the Supplementary Studies (1998 A, unpublished). The factors did not have statistically significant impacts on each other, although the single variables had; self-esteem influenced the perception of co-operation between workers and possi-

bilities of participation. A worker with a greater self-esteem perceived that there was a better collaboration between workers and his or her opportunities for participation were greater than in the opposite case. Self-esteem also had an impact on perceived job characteristics (Skill Variety, Autonomy) via willingness to develop working conditions. A worker with a greater self-esteem was more willing to develop working conditions, perceived to be able to use his or her skills more properly and to have more Autonomy in the job than in the opposite case (page 34).

The results (Supplementary Studies 1998 A, unpublished) were partly in contradiction with the original presumption about the influence of cognitive factors on the perception of organisational functioning and job characteristics on a general level. Although the influence could not be shown as to the factors found (Job meaningfulness and the Sense of Competence for Development), interrelationships between single variables could be found.

The results showed the significance of personal factors in the perception of organisational functioning and job characteristics according to the general principles of human behaviour. The results emphasised the importance of SCD in perceiving the working environment, which is based on a person's emotional reactions due to the work load caused by the working environment. A worker with a greater mental work load had a lower self-esteem and he or she was less willing to develop working conditions than in the opposite case. The findings seem to mean that a person's perceptive processes are influenced by his or her emotions. In this respect the results did not support Bandura's (e.g. 1991) presumptions about the influence of self-efficacy on one's emotional reactions. Indirect influences were, however, found.

The results gave new knowledge about the role of individual factors in the perception of job characteristics presumed by the developers of the method (Hackman & Oldham, 1971, 1974; Turner & Lawrence, 1965). It is to be assumed that objective job characteristics influence a worker's cognitions via his or her emotional mental state. The more suitable the objective work characteristics for workers' are, the less mentally strained they are the greater their self-esteem is and the more willing they are to develop the working conditions, and vice versa. Thus mental strain is of crucial importance in the perception of job characteristics.

The results did not give full support to the authors (e.g. Levin & Stokes, 1989) who have stressed the meaning of special individual affective factors like negative affectivity in the perception of job characteristics. The results supported partly arguments (e.g. Renn & Vandenberg, 1995) according to which job characteristics have both direct and indirect influences on a worker. Renn & Vandenberg (1995) argued that the direct influences of job characteristics represent an individual's immediate emotional response to the job, which reaction is based on the momentary activation of special cognitions. Full support could not be found for their latter assumptions; it was rather to be assumed that emotional reactions influenced cognitions, which had secondary effects on perceived.

(emotional) mental state. A worker with a higher mental strain had lower self-esteem and he or she was less willing to develop working conditions; this in turn caused an increase of mental strain.

The design of the study - based on linear relationships - excluded a possibility of clarifying the influence of contextual factors, as many authors (e.g. Fried & Ferris, 1987) have proposed. This does not, however, mean that there would not be such effects with another kind of design.

The results mean that the possibility of a methodological bias presented by some authors (e.g. Algera, 1990) can be excluded in this case. It has been presented that a bias might be caused by the fact that it is the same person who perceives both job characteristics and a working environment as also the others' behaviour, reactions and attitudes. It can be supposed that the effects of such kind of influences are not shown in the analyses based on the data of averages.

Self-Esteem and the Perception of Organisational Functioning

Self-esteem representing the found factor of the *Sense of Competence for Development* (SCD) influenced the perception of collaboration between workers as well as participation and willingness to develop working conditions (Study IV, originally published 1997, page 37). Self-esteem was influenced by mental well-being, especially by ability to act as a sign of mental strain (page 34).

The discovery of the factor *the Sense of Competence for Development* (SCD) is of special importance when talking about a person's inner cognitive models for mastering tasks; the close interrelationship of self-esteem and willingness to develop working conditions refers to one's perception of mastery over his or her working environment. The result is in accordance with White's (1959) assumptions - based on his predecessors' (Angyal, 1941; Woodworth, 1958) work - about the meaning of *competence motivation*.

Angyal (1941) presented that a human being has a characteristic tendency towards self-determination. Woodworth (1958) supposed that all human behaviour is directed primarily towards dealing with the environment. Ganster & Fuslier (1989) presented that human behaviour is goal oriented and selective, because a person has got a need for managing his or her environment. White (1959) partly agreed with Woodworth; he also supposed that a human being had an intrinsic need to deal with the environment. But he argued that it was necessary to connect motivation with *the concept of competence*. He argued that there was a special *competence motivation* as well as competence in its more familiar sense of achieved capacity.

It may be that workers' cannot be motivated unless they can feel that it is possible to do things. Bandura's (e.g. 1996) thoughts of self-efficacy also supported this assumption. He presented (1996) that unless people believe that it is possible for them to achieve

the selected goals, they do not try to. This can happen because they are not *competence motivated*.

The results also support later discussions in the literature about the *sense of control* or feelings of mastery in perceiving the working environment. Antonovsky (e.g. 1979, 1987) used the concept of the *Sense of Coherence* referring to the sense which a person's internal and external environment makes to her or him being predictable (comprehensibility), sense of control (manageability) and meaningfulness. He (1979, p. 123) defined the concept as follows: "A global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one's internal and external environments are predictable and that there is a high probability that things will work out as well as can reasonably be expected."

In short, the Sense of Coherence - according to him - meant that things are in order, in control and meaningful. He was of the opinion that self-esteem was in connection with the sense of control. He (Antonovsky, 1984) assumed that participation was important to a worker because of meaningfulness. The Sense of Coherence meant to Antonovsky health resources with buffering effects against stress. It seems that Antonovsky used his concept *the sense of control* nearly in the same meaning as White did (1959) using the concept of *the sense of competence* mentioned above.

The results were also in accordance with Huhtaniemi's (1995) and Järvikoski's (1994) findings. Huhtaniemi (1995) used the concept of *the sense of life-control* by which she meant a human resource against stress and a means for achieving a goal. Järvikoski (1994) found that the sense of life-control was in connection with one's conception about oneself and correlated with one's self-esteem. The results supported also the findings of Kalimo & Toppinen (1993). They argued that the general sense of life-control, which was included in human resources, increased workers' well-being. The results in this study (Supplementary Studies 1998 C, unpublished) showed that willingness to develop working conditions influenced one's job satisfaction and thereby one's mental well-being (page 34).

The results were also in accordance with Karasek & Theorell's (1990) and Kobasa's (1979) as well as Leppänen's (1993) arguments. Karasek (e.g. 1979; Karasek & Theorell, 1990) used the concept of demand and control when speaking about workers' possibility to influence their job performance. Leppänen (1993) found that activity and the *perception of competence* in the development of work protected workers better from long-term stress effects than the conceptual mastering of the work. Kobasa (1979) used the concept of *hardiness* for the generalised feeling of control. This meant that one had a belief of being able to master situations, an emotional commitment to different functions and the perception of change as a challenge.

This study (Study IV, originally published 1997) supported both the French & Caplan (1972) and the trait models (e.g. Epstein, 1983; Saari & Majander, 1985; Tice & Baumeister, 1990). It seems that mental strain influences one's self-esteem, and vice

versa, but not directly; the influence is mediated by the willingness to develop working conditions and by the factors of organisational functioning like collaboration between workers and participation (pages 34, 37). The influences may not function simultaneously either. The results supported the assumptions that self-esteem may also be influenced by non-traumatic experiences in adulthood (e.g. Argyris, 1964; Gergen, 1971; Kernis et al., 1989; Warr & Wall, 1975).

The interrelationship of a higher self-esteem with the perception of better collaboration between workers and participation (Study IV, originally published 1997) may be explained by a person's *inner coherence* as Deci & Ryan (1991) presented. They supposed that a person's inner coherence may be a prerequisite for interpersonal relationships. It may be that when a worker believes that he or she is as worthy as the others and can manage tasks as well as the others, it is easier for the worker to participate and collaborate with the other workers and that is why he or she perceives that these things are OK. An interesting new thing was the finding that inner coherence was influenced by the perception of objective working environment via the person's emotional reactions (page 34). Interesting was also the finding that the influences could be found on a general level, independent of contextual and specific personal factors.

In summary, it seems that mental strain and self-esteem influence (independent of contextual and specific individual influences) a person's perception of organisational functioning, and perhaps via that, the perception of the opportunity for social support from co-workers. Thus it seems that the feelings of mastery cause a person positive perceptions of organisational functioning, characteristics of work and job satisfaction. But this perception has an emotional basis caused by objective characteristics of working environment.

Self-Esteem: A Personal Resource for Coming off in a Working environment

In this study (Study IV, originally published 1997; Supplementary Studies 1998 B, unpublished), self-esteem influenced willingness to develop working conditions, which in turn influenced directly the perception of Skill Variety and Autonomy (pages 34, 37, 51).

The results were contradictory as for the original hypothesis, according to which cognitive factors would not influence one's perception of work characteristics - not at least on a general level. The finding was new and quite interesting, because the developers of the JDS (Hackman & Lawler, 1971; Hackman & Oldham, 1974, 1976; Turner & Lawrence, 1965) originally expected that there is a one-way influence of job characteristics on motivation.

A worker's perception of higher Skill Variety and Autonomy in work may be explained by a higher *competence motivation*. The perception of higher competence for

development makes the worker perceive that the content of work is better than in the opposite case; perhaps with the ulterior motive of being able to influence one's job content or job performance (pages 34, 51).

In the light of the previous discussion about the content of the concept of self-esteem (Coopersmith, 1967; Rosenberg, 1979) and self-efficacy (Bandura, 1988, 1992), it is likely that the *perception of competence* (a part of self-esteem or self-efficacy) influences one's willingness to develop working conditions, which can be thought to represent *competence motivation* (White, 1959). It has to be noticed, however, that the influence is aroused by the emotional factors of mental state (page 34).

An explanation may be that when a person perceives more mental strain due to the objective characteristics of work, his or her self-esteem decreases with the increase of depression. This, in turn, decreases the person's willingness to develop working conditions, because he or she feels less competent for functioning. The lowered perception of competence and development motivation makes the person perceive that the job offers less possibilities of controlling the way of working and of using his or her skills in an appropriate way. This could be explained by perceived uncertainty because of the decreased feelings of competence. In addition to the decrease of motivation and due to the loss of energy, a person does not dare take challenges and use his or her skills.

The previous explanation would be in accordance with Saari & Majander's (1985) results. They found that persons with a lowered self-esteem differed from those with a higher self-esteem as for ability to take challenges. The findings are important from a theoretical point of view, because the interrelationships did not include the effects of special contextual or individual factors; they were shown on a general level.

Emotional and Cognitive Factors: A Functional Unity

A worker's (emotional) *mental state* (well-being) was found to be related with the variables of the factor *Sense of Competence for Development* (Study IV, originally published 1997; Supplementary Studies 1998 A, unpublished); mental strain (ability to act) influenced self-esteem, and this, in turn, mental strain via willingness to develop working conditions (page 34). In the Supplementary Studies (1998 D, unpublished) it was shown that the variables of the factors of mental well-being and the Sense of Competence for Development were loaded on the same factor .

A new thing in this study was that the variables of the factor *the Sense of Competence for Development*, which can be defined as a kind of *sense of competence* (White, 1959), were found to be connected with a person's emotional state - *mental well-being* and to be in bi-directional interface with each other. The findings clarified the role of emotional factors behind the sense of competence and *competence motivation* (White, 1959). The importance of the findings was emphasised by the general level of the effects.

The findings of this study (Study IV, originally published 1997; Supplementary Studies 1998 D, unpublished) gave support to the arguments according to which the perception of control was seen as a resource for coping with work stress (Antonovsky, 1979, 1984, 1987; Fisher, 1984; Huhtaniemi, 1995; Järvikoski, 1994; Karasek, 1979; Karasek & Theorell, 1990; Sterling & Allostasis, 1988; Theorell & Karasek, 1996).

The findings also supported the conception according to which self-esteem can also be influenced by non-traumatic experiences (e.g. Argyris, 1964; Gergen, 1971; Kernis et al., 1989; Warr & Wall, 1975). Support was found for the ideas of French & Caplan (1972) and Kivimäki & Kalimo's (1996) assumptions about the meaning of work stress on self-esteem; self-esteem influenced, although indirectly, mental strain and the perception of working environment.

The findings gave partly support to Bandura's arguments (1992) that self-efficacy does not influence reactively one's emotional reactions. In this study the influence on mental state was mediated via willingness to develop working conditions and the perception of working environment (page 34). Bandura, a representative of the social cognitive theory, argued (e.g. 1991) that one's self-evaluative system (self-efficacy) is influenced by a self-regulatory mechanism, in which self-monitoring has the central role. Self-efficacy, according to him, influences one's behaviour on the four main levels: cognition, affection, motivation and functioning.

Job Characteristics and Sick Absenteeism

According to the findings of this study (Study IV, originally published 1997), *Skill Variety* and *Task Significance* were in a negative relation to the number of sick absenteeism days per organisation and per worker and the duration of sick absenteeism period per worker.

The results were in accordance with the original hypothesis about the influence of job characteristics on workers' health independent of the influence of any special personal or contextual factors. The results gave support to the earlier findings (Gehardt, 1988; Hänsgen et al., 1995; Renn & Vandenberg, 1995) about the positive correlation between objective job characteristics and workers' perception of the characteristics.

In this study the impact of specific contextual or personal factors could not be shown because of the design of the study based on linear relationships and averages. Thus the findings supported the JDS developers' assumptions about the relationship of objective job characteristics with sick absenteeism (Hackman & Lawler, 1971; Hackman & Oldham, 1974, 1976; Turner & Lawrence, 1965). The results also gave support to Cooper & Davidson's (1987) view of the importance of the underutilisation of skills in stress process and to Karasek's Expanded Demand/Control Model (DCSM) as to the

health consequences of job demands (Karasek, 1979; Karasek & Theorell, 1990; Kristensen, 1995; Theorell & Karasek, 1996).

The results partly supported presumptions (e.g. Levi, 1972, 1994) about the role of mediating personal and social factors between the perception of the objective working environment and behavioural outcomes. However, the influences were shown on a general level (Study IV, originally published 1997). On the basis of these studies, it is obvious that the health effects of job characteristics are mediated via the perception of mental work load to a person's self-esteem. A possible intervening variable in connection with lowered mental energy is depression, which - connected to lowered self-esteem - causes the increase of sick absenteeism (see e.g. Kouzis & Eaton, 1994, the next chapter).

The intermediary nature of general personal factors was also supported by the interrelationships found between cognitions and emotions (see the previous chapter); self-esteem influenced mental well-being via willingness to develop working conditions. Personal factors, especially *the Sense of Competence for Development (SCD)* (Supplementary studies 1998 A-C, unpublished), seem to play an important role in the perception of control over one's work. This in turn influences the perception of mental load (pages 34, 36). So the results supported many authors' arguments about the importance of the sense of control or coherence in the perception of mental load (e.g. Antonovsky, 1979; Fisher, 1984; Huhtaniemi, 1995; Järvikoski, 1994; Karasek, 1979; Sterling & Allostasis, 1988). The results also supported the underlying assumptions of the meaning of mental models in the control of work (e.g. Hacker, 1982; Keskinen, 1982; Keskinen, 1990; Neisser, 1982).

The results also supported some authors' (e.g. Baker, 1985; Kasl, 1989) arguments about the cumulative nature of stress; the effects of job characteristics on mental state were combined with the effects of organisational functioning (Study IV, originally published 1997).

The results of this study (Study IV, originally published 1997) supported indirectly some other authors' (e.g. Gardell, 1982; Kohn & Schooler, 1983) findings about the interrelationships of job characteristics and leisure time activities. Gardell (1982) found that poor opportunities for participation decreased participatory activities in leisure time.

It might be supposed that the more a person has personal resources left after a work day, the more likely he or she has strength to take part in all kinds of leisure time activities. Karasek (1981) discovered in a longitudinal study that workers whose work had changed had become more active and participatory in their leisure time. It was also found (Kohn & Schooler eds., 1983) that job complexity was related to free-time intellectual activities.

An interesting new thing was that Skill Variety was related to the number of sick absenteeism days per organisation (page 41), whereas Task Significance was in connection with the number of sick days and the duration of sick absenteeism period per worker.

When work offered more challenges (the possibility of using one's skills), there were fewer sick days in the organisation than in the opposite case. When workers felt that their job was socially more significant, they were absent from the job for sickness more seldom and the period of sick absenteeism was shorter than in the opposite case. This finding may be related to the structural features of job; Skill Variety is probably a more structural (objective) characteristic of job compared with Task Significance. The latter of the two may imply an evaluation of the personal meaning of the job characteristics, and because of that it was in relationship with personal sick days. This might be of importance in job redesign. In addition to the structural content of the job, the personal meaning of the job should also be taken into consideration in job redesign projects.

Self-Esteem and Sick Absenteeism

The results of this study (Study IV, originally published 1997) showed that workers' self-esteem was negatively related to sick absenteeism so that an increase in self-esteem was connected with the decreased number of sick days per organisation.

The results were in accordance with the original assumption about the interrelationship between self-esteem and sick days. Thus the results supported earlier findings (e.g. Kalimo & Toppinen, 1993) about the relation of experienced health status to self-esteem. The results also supported many authors' arguments about the importance of lower self-esteem as a cause of mental difficulties (e.g. Bandura, 1986; Bednar et al., 1989; Rosenberg, 1962) or stress (e.g. Epstein, 1983; French & Caplan, 1972; Kauppinen-Toropainen, 1987; Kivimäki, 1996; Saari & Majander, 1985).

The results supported arguments which have stressed the importance of *the sense of control* to self-esteem (Antonovsky, 1979; Bandura, 1996). Antonovsky (1979) presented the concept of the *General Resistance Resource*, which included the *Sense of Coherence* (SOC). He argued that the Sense of Coherence prevented stress and was in connection with self-esteem.

The results gave support to Bandura's (1996) rationale of the role of one's sense of control and social efficacy in the development of depression. The results could not, however, confirm his assumptions. Bandura (1996) presented that perceived inefficacy to control things and values produced depression; this according to him weakens a person's belief in his or her efficacy. He also argued that depression could also be arisen through a low sense of *social efficacy*; of not being able to create satisfying social relationships, and because of that, not having the possibility of social support from the others for cushioning the effects of chronic stressors.

According to the results (Study IV, originally published 1997), the role of mental well-being, especially mental strain, could be shown to be important to self-esteem and, likely, to depression too. With this assumption the results supported the findings of

Kouzis & Eaton (1994) about the role of depression in sick days. They noticed that depression was connected with sick absenteeism: the probability of depressed persons being absent for sickness was much greater (27 x) than that of non-depressed persons.

The results also supported Kivimäki & Kalimo's (1996) and Kivimäki's (1996) results. Kivimäki & Kalimo (1996) found that chronic work stress was in a positive relationship with *the lack of competence*, and they presented that this could contribute to the decrease of self-esteem. Kivimäki (1996) found that self-esteem correlated negatively with the worker's stress symptoms.

In the light of the literature it seems that the perception of self-esteem is connected with health-preventing or promoting factors (e.g. Wiedenfeld & al., 1990), which may be in connection with a person's biological resistance system. Wiedenfeld et al. (1990) discovered in experimental conditions that a strong increase of perceived self-efficacy in regulating a person's phobic reactions enhanced his or her immunity. The results of this study (Study IV, originally published 1997; Supplementary studies 1998 B,C, unpublished) showed that the items (e.g. self-esteem) of the factor *Sense of Competence for Development (SCD)* influenced workers' perception of organisational functioning and job characteristics as well as mental well-being (pages 34, 36). Thus mental well-being was influenced by many factors, all of which had an impact on self-esteem.

The findings of the interrelationship between self-esteem and the number of sick absenteeism days in an organisation may refer to the structural basis of the influence of working conditions on workers' mental well-being. A new thing was that self-esteem could be shown to be in a negative relation to sick-absenteeism on a general level. A question of crucial importance was left open: in what way are self-esteem and depression linked to each other? It would be of special interest to clarify the role of changes in a person's immunity system in this process. This should be studied more exactly in future.

Co-Operation and Sick Absenteeism

According to the findings of this study (Study IV, originally published 1997), workers' perception of a better collaboration between them decreased the number of sick absenteeism days in the organisation.

The results supported the author's original expectation about the interrelationship of social integration (co-operation) and a person's health indicated by sick days. Thus the results in this study were in accordance with many others with the same kind of view (e.g. Berkman, 1985; House, 1981; Karasek & Theorell (1990).

The results partly supported Cohen & Wills's (1985) presumptions about the direct influence of social integration on a person's mental well-being. According to the results (Supplementary Studies 1998 C, unpublished), social integration - indicated by

co-operation (as part of organisational functioning) - influenced a person's mental well-being (mental load) via the perception of job satisfaction (page 34). In this study it was, however, difficult to clarify the impact of active social support on one's mental well-being as Cohen & Wills (1985) presented. The concept of co-operation resembled best the concept of the perceived *quality of personal relationships* by Winbust et al. (1988), who considered it as a type of social support.

Anyway, it can be assumed that social integration (co-operation) also includes features of active social support. With this assumption the results of this study supported many others' (e.g. Kalimo, 1980; Karasek & Theorell, 1990; Revicki & Gershon, 1996; Theorell & Karasek, 1996) arguments about the importance of social support to a person's perception of work stress or health.

The findings were in accordance with Banduras's (1996) assumptions about the importance of social efficacy. He presented that the sense of social efficacy was in relation to the possibility of social support and the ability to create satisfying human relationships. This - according to him - was related to depression. The increase of sick days (see the discussion in the previous chapters) might be explained by depression due to lowered mental well-being (mental load) in connection with the lowered *Sense of Competence for Development*.

The results did not support directly the assumptions of Karasek et al. (1982) about the equal importance of the different kinds of social support; co-operation between workers seemed to be more significant of sick days per organisation. Neither supported the findings their assumptions of the different role of social support in the sub-groups of different stress levels (Karasek et al., 1982; Saari & Majander, 1985); the impacts found were shown to be linear by their nature. On the other hand, the effects of social support in sub-groups were not clarified in this study.

The results of this study (Study IV, originally published 1997) supported the importance of personal factors in the perception of social relationships presented in some studies (e.g. Deci & Ryan, 1991). Deci & Ryan (1991) assumed that social support was based on human personality, more exactly, personal integrity: the better one's personal integrity, the better opportunities he or she had for social support. It was found (Study IV, originally published 1997) that self-esteem, a part of *the Sense of Competence for Development*, influenced one's perception of co-operation between workers and opportunities for participation. These factors influenced workers' mental well-being via job satisfaction (Supplementary Studies 1998 C, unpublished) (pages 34, 36). A new thing was the finding that the effects could be shown on a general level.

The results also supported Vahtera's (1993) findings about the importance of the perception of work control to the perception of social competence. According to the results (Study IV, originally published 1997; Supplementary Studies 1998 B, unpublished), *the Sense of Competence for Development* was of crucial importance both as to the perception of job characteristics and the perception of co-operation and participation.

In all, it seems that social integration - representing a kind of social support - is an important factor influencing workers' mental well-being and health. A new thing was the finding of the strong influence of *collaboration between the workers* on the sick absenteeism days per organisation on a general level (page 41). This may refer to its special importance as a buffering organisational factor against work stress (see e.g. Cohen & Wills, 1985).

General Conclusions

The Finnish versions of the methods used (JDS, EZ) seemed to be reliable and usable for evaluating working conditions. As a new thing the importance of cognitions to the perception of job characteristics could be shown. In the light of the results the Job Characteristics Model (JCM) should be evaluated again. The Finnish version of the EZ method with 39 items was shown to have about the same reliability as the newer international versions of the method. The reliability of the method was increased by the findings of the theoretical model (mental state) by the confirmatory factor analysis.

The study produced additional information about the general interrelationship between perceived working environment and a person's mental factors. New information was also acquired about the interrelationships between one's cognitions and emotional state in the way defined in the study. The results encouraged the discussion about the interface of perceived and objective working environment and the interrelationship between an organisation and a worker concerning a person's health.

A result of special importance concerns the findings of structural and causal models independent of a single individual and a special organisation. It has to be noticed, however, that there may also be other influencing factors than those used in the models. This has to be taken into consideration in the interpretation of the results. The results showed that objective working conditions have an impact on workers' mental functions and health; good working conditions improve workers' mental well-being, whereas bad conditions decrease it, for example in the form of increased sick leaves. On the other hand, healthier workers seem to be more willing and capable of developing working conditions and of taking challenges in their job than in the opposite case.

The results also gave ground for considerations on organisational health. Attention should be paid to taking care of both a single worker's health and organisational health, the functioning of the organisation and the perceived characteristics of work as well as their influences on a person's self-esteem, motivation of organisational development and mental state.

In this study a healthy organisation is characterised by workers' perception of the good organisational functioning and the good characteristics of work. Of special importance in organisational functioning is the style of leadership including workers' oppor-

tunities for participation and co-operation with workers as well as between workers. The role of the structural features of an organisation seems to be important to workers' health as well. The importance of the functioning of occupational safety and health staff was shown. The poor influence of occupational health care on workers' mental well-being may indicate a strong need for developing this supportive organisational structure, too.

In the light of the results, workers' perception of job satisfaction is an important factor for mental well-being and worth taking into consideration in organisational development processes. It is likely that job satisfaction is an important general sign of organisational health status, the role of which has been undervalued at least in Finnish working life.

As for methodological development, the results encourage the use of the Lisrel method in the development of structural and functional models between variables. Although the framework of the study implies the best applicability of the results to blue-collar workers in the public sector, it seems that the general interrelationships of the factors found might be typical of all workers in working life. Anyway, there are no such things to be seen which could undermine this assumption. To improve the generalisation of the results, the discovered phenomena could be examined in other occupational groups than those used in this study. It would be interesting to clarify whether the factor structures found can be repeated from one measurement to another. This would require a longitudinal study with larger data than what was used now.

5. References

Algera, J. A. (1990). The job characteristics model of work motivation revisited. In U. Kleinbeck, H. H., Quast, H. Thierry and H. Häcker (Eds.). *Work Motivation*. Hillsdale: Erlbaum.

Amatea, E. S. & Fong M. L. (1991). The impact of role stressors and personal resources on the stress experience of professional women. *Psychology of Women Quarterly*, **15**, 419-430.

Angyal, A. (1941). *Foundations for a Science of Personality*. New York: Commonwealth Fund.

Ansoff, H. I. & Brandenburg, R. G. (1971). A language for organization design. *Management Science*, **17**, 705-731.

Antonowsky, A. (1979). *Health, Stress and Coping*. San Francisco: Jossey Bass.

Antonowsky, A. (1984). The sense of coherence, determinant of health. In J. D. Matarazzo, S. M., Weiss, J. A. Herd & N. E. Miller (Eds.). *Behaviour Health. A Handbook of Health, Enhancement and Disease Prevention*. New York: Wiley.

Antonowsky, A. (1987). Health promoting factors at work: The sense of coherence. In R. Kalimo, M. A. El-Bataw & C. Cooper (Eds.). *Psychosocial Factors at Work and Their Relation to Health*. Geneva: WHO.

Apenburg, E. & Häcker, H. (1984). Untersuchungen zur Modifikation der Eigenzustandsskala von NITSCH. Wuppertal: *Wuppertaler Psychologische Berichte* 3/1984.

Apenburg, E. (1986). Befindlichkeitsbeschreibung als Methode der Beanspruchungsmessung. Untersuchungen zur Entwicklung und Validierung einer modifizierten Fassung der

Eigenzustandsskala von Nitsch. *Psychologie und Praxis- Zeitschrift für Arbeits und Organisationspsychologie*, **30**, 3-13.

Argyris, C. (1964). *Integrating the Individual and the Organization*. New York: Wiley.

Argyris, C. (1985). *Strategy, Change and Defensive Routines*. Boston: Pitman.

Baker, D. B. (1985). The study of stress at work. *Annual Review of Public Health*, **6**, 367-381.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change, *Psychological Review*, **8**, 191-215.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1988). Self regulation of motivation and action through goal systems. In V. Hamilton, G. H. Bower & N. H. Fridja (Eds.). *Cognitive Perspectives on Emotion and Motivation*. Dordrecht: Kluwer.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology*, **25**, 729-735.

Bandura, A. (1990a). Some reflection on reflections. *Psychological Inquiry*, **1**, 101-105.

Bandura, A. (1990b). Perceived self-efficacy in the exercise of personal agency. Fourth Annual Conference of the Association for the Advancement of Applied Sport Psychology 1989, Seattle, Washington. *Journal of Applied Sport Psychology*, **2**, 128-163.

Bandura, A. (1991). Social cognitive theory of self-regulation. Special Issue: Theories of cognitive self-regulation. *Organisational Behaviour and Human Decision Processes*, **50**, 248-287.

Bandura, A. (1992). On rectifying the comparative anatomy of perceived control: Comments on "Cognates of personal control". *Applied and Preventive Psychology*, **1**, 121-126.

Bandura, A. (1995). Comments on the crusade against causal efficacy of human thought: Special Issue: Cognition, behaviour and causality: A broad exchange of views stemming

from the debate on the causal efficacy of human thought. *Journal of Behaviour Therapy and Experimental Psychiatry*, **26**, 179-190.

Bandura, A. (1996). Personal and collective efficacy in human adaptation and change. In J. G. Adair, D. Bélanger & L. Dion (Eds.). Congress Proceedings XXVI International Congress of Psychology Montreal 1996. *Advances in Psychological Science*, **1**, 51-71.

Bandura, A., & Jourden, F. J. (1991). Self-regulatory mechanisms governing the impact of social comparison on complex decision making. *Journal of Personality and Social Psychology*, **60**, 941-951.

Bednar, R. L, Wells, M. G. & Peterson S. R. (1989). *Self-esteem: Paradoxes and Innovations in Clinical Theory and Practice*. Washington: American Psychological Association.

Beekhard, R. (1969). *Organization Development. Strategies and Models*. Reading: Addison-Wesley.

Berkman, L. F. (1985). The relationship of social networks and social support to morbidity and mortality. In S. Cohen & S. L. Syme (Eds). *Social Support and Health*. New York: Academic Press.

Brannon, D., Smyer, M. A., Cohn, M. D., Borchardt, L., Landry, J. A., Jay, G. M., Garfein, A. J., Malonebeach, E. & Walls, C. (1988). A Job Diagnostic Survey of nursing home caregivers: Implications for job redesign. *The Gerontologist*, **28**, 246-252.

Cohen, S. & Wills, T. A. (1985). Stress, social support and buffering hypothesis. *Psychological Bulletin*, **98**, 310-357.

Cooper, C. L. & Cartwright, S. (1994). Healthy mind;. Healthy organization - a proactive approach to occupational stress. *Human Relations*, **47**, 455-471.

Cooper, C. L. & Davidson, M. (1987). Sources of stress at work and their relation to stressors in non-working environments. In R. Kalimo, M. A. El-Bataw, C. L. Cooper (Eds). *Psychosocial Factors at Work and Their Relation to Health*. Geneva: WHO.

Cooper, C. L. & Payne, R. (1978). *Stress at Work*. London: Wiley.

Coopersmith, S. (1967). *The Antecedents of Self-Esteem*. San Francisco: Freeman.

- Cordery, J. L. & Sevastos, P. P. (1993). Responses to the original and revised Job Diagnostic Survey: Is education a factor in responses to negatively worded items? *Journal of Applied Psychology*, **78**, 141-143.
- Costigan, R. D. (1996). Effects of information processing on post realistic job preview perceptions. *Journal of Social Behaviour and Personality*, **11**, 51-61.
- Cox, T. (1993). *Stress Research Management: Putting Theory to Work*. Health and Safety Executive contract research report no 61, Health and Safety Executive: London.
- Cronbach, L. J. (1965). *Essentials of Psychological Testing*. New York: Harper & Row.
- Cummings, T. G. & Mohrman, S. A. (1987). Self-designing organizations: Toward implementing quality of work life innovations. *Research in Organizational Change and Development*, **1**, 1275-1310.
- Dean, K. & Hancock, T. (1992). *Supportive Environments for Health*. Copenhagen: WHO
- Deci, E. L. & Ryan R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.). Nebraska Symposium on Motivation 1990. *Perspectives on Motivation*, **38**, 237-288.
- Dooley, D., Rook, K. & Catalino, R. (1987). Job and non-job stressors and their moderators. *Journal of Occupational Psychology*, **60**, 115-132.
- Eklund, K. & Suikkanen, A. (1982). *Työväen suojelusta työsuojeluun. Työsuojelu ja työolojen kehitys Suomessa 1970-luvulla*. Helsinki: Tammi.
- Engeström, Y. (1995). *Kehittävä työntutkimus. Perusteita, tuloksia ja haasteita*. Helsinki: Hallinnon kehittämiskeskus.
- Engeström, Y. (1987). *Learning by Expanding*. Helsinki: Orienta-Konsultit Oy.
- Epstein, S. (1983). The unconscious, the preconscious and the self-concept. In J. Suls & A. Greenwald (Eds.). *Psychological Perspectives on the Self (vol.2)* Hillsdale: Erlbaum.
- Evans, G. W., Johansson, G. & Carrere, S. (1994). Psychosocial factors and the physical environment: inter-relations in the workplace. *International Review of Industrial and Organisational Psychology*, **9**, 1-29.

- Fisher, S. (1984). *Stress and Perception of Control*. London: Erlbaum.
- Fletcher, W. L., Hansson, R. O. & Barley, L. (1992) . Assessing occupational self-efficacy among middle aged and other adults. *Journal of Applied Gerontology*, **11**, 489-501.
- French, J. R. P. & Caplan, R. D. (1972). Organization stress and strain. In A. J. Marrow (Ed.). *The Failure of Success*. New York: Amacom.
- French, J. R. P. (Jr.), Rogers, W. & Cobb, S. (1974). Adjustment as person-environment fit. In G. V. Coelho, D. A. Hamburg & J. E. Adams (Eds.). *Coping and Adaptation*. New York: Basic Books.
- Fried, Y. & Ferris, G. R. (1987). The validity of the job characteristics model: A review and meta-analysis. *Personnel Psychology*, **40**, 287-322.
- Ganster, D. C. & Fusilier, M. R. (1989). Control in the workplace. In C. L. Cooper & I. T. Robertson (Eds.). *International Review of Industrial and Organizational Psychology*. Chichester: Wiley.
- Gardell, B. (1982). Worker participation and autonomy: A multilevel approach to democracy at the workplace. *International Journal of Health Services*, **12**, 527-558.
- Gergen, L. K. (1971). *The Concept of Self*. New York: Holt, Rinehart & Winston.
- Gehardt, B. (1988). Sources of variance in incumbent perceptions of job complexity. *Journal of Applied Psychology*, **73**, 154-162.
- Hacker, W. (1982). *Yleinen työpsykologia*. Saksalainen alkuteos: *Allgemeine Arbeits- und Ingenieurpsychologie*. Suom. Lea Norros., Espoo: Weilin + Göös.
- Hacker, W. (1985). Activity: A fruitful concept in individual psychology. In M. Frese & J. Sabini (Eds.). *Goal Directed Behaviour*. Hillsdale: Erlbaum.
- Hacker, W. & Richter, P. (1980). *Spezielle Arbeitspsychologie 2. Psychische Ermüdung, Monotonie, Sättigung und Stress*. Berlin: VEB Deutscher Verlag der Wissenschaften.
- Hackman, J. R. & Lawler, E. E. (1971). Employee reactions to job characteristics. *Journal of Applied Psychology*. **55**, 259-286.

- Hackman, J. R. & Oldham, G. R. (1974). *The Job Diagnostic Survey: An Instrument for the Diagnosis of Jobs and the Evaluation of Job Redesign Projects*. Rep 4. Department of Administrative Science. New Haven: Yale University.
- Hackman, J. R. & Oldham, G. R. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology*, **60**, 159-170.
- Hackman, J. R. & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behaviour and Human Performance*, **16**, 250-279.
- Hahn, E. (1986). *Pausenorganisationsvarianten bei Bildschirmarbeit zum Vermeidung Psychischen Fehlbeanspruchung*. Wissenschaftliche Beiträge. Jena: Friedlich - Schiller - Universität.
- Harrison, T. M. (1985). Communication and participative decision making: an exploratory study. *Personnel Psychology*, **38**, 93-116.
- Heikkinen, P. (1990). *Yhteistyön kehittämisen vaikutuksista työtyytyväisyyteen ja sisäiseen työmotivaatioon*. Moniste. Tampere: Työsuojeluhallitus.
- Helminen, A. (1998). *Associations of Social Support with Carotid Artherosclerosis and its Risk Factors*. Kuopio University Publications D. Medical Sciences (no 151). Kuopio: Kuopio University.
- Hinckley, S. R. (Jr.) (1985). A closer look at participation. *Organizational Dynamics*, **13**, 57-67.
- House, J. S. (1981). *Work Stress and Social Support*. Massachusetts: Addison-Wesley.
- Huhtaniemi, P. (1995). *The Sense of Life Control and Thoughts of Early Retirement*. Turun yliopiston julkaisuja B:210, Turku: Turun yliopisto.
- Hämäläinen, R., & Suurnäkki, T. (1995). *Työsuojelun toimintaohjelma Keski-Suomen työsuojelupiirin ja alueen kuntien yhteistyön välineenä*. Raportti v. 1992-1994 toteutetusta kehittämishankkeesta. Työhallinnon julkaisu 80. Tampere: Työministeriö.
- Hänsgen C., Hennmann, E., Merboth, H. & Richter, P. (1995). Job demands, work safety, and mental health. In W. Hacker, P. Richter & T. Wagner (Eds.). *Analysis and*

Design of Mental Work. IV work shop TU Helsinki - TU Dresden. Dresden: University of Technology.

Idaszak, J. R., Botton, W. P. & Drasgow, F. (1988). A test of the measurement equivalence of the revised Job Diagnostic Survey: Past problems and current solutions. *Journal of Applied Psychology*, **73**, 647-656.

Immonen, S. (1993). *Vuorovaikutus johtamisen välineenä: Tutkimus toimistoesimiesten vuorovaikutukseen käyttämästä ajasta*. Reports no 150, Teollisuustalous ja työpsykologia. Otaniemi: Helsingin teknillinen korkeakoulu.

Israel, B. A., House, J. S., Schurman, S. J., Heaney, C. A et al. (1989). The relation of personal resources, participation, influence, interpersonal relationships and coping strategies to occupational stress, job strains and health: A multivariate analysis. *Work and Stress*, **3**, 163-194.

Johansson, G. & Gardell, B. (1988). Work-health relations as mediated through stress reactions and job socialization. In S. Maes & al. (Eds.). *Topics in Health Psychology*, 271-285. Chichester: Wiley.

Järvenpää, E. (1991). *Mental Workload: Research on Computer Aided Design Work and on the Implementation of Office Automation*. Teollisuustalous ja työpsykologia. Raportti 130. Espoo: Helsingin teknillinen korkeakoulu.

Järvenpää, E. & Martinsuo, M. (1997). Measurement of organizational culture in different culture contexts. In P. Seppälä, T. Luopajarvi, C.-H. Nygård & M. Mattila (Eds.). *Organizational Design and Management*. Proceedings of the 13th Triennial Congress of the International Ergonomics Association 1997, Tampere, Finland. (vol I). Helsinki: Finnish Institute of Occupational Health.

Järvikoski, A. (1994). *Vajaakuntoisuudesta elämänhallintaan? Kuntoutuksen viitekehysten ja toimintamallien tarkastelu*. English summary. Kuntoutussäätiön tutkimuksia (no 46). Helsinki: Yliopistopaino.

Jöreskog, K. & Sörbom, D. (1986). *PRELIS. A Program for Multivariate Data Screening and Data Summarization. A Preprocessor for Lisrel, 2nd ed*. Chicaco: Scientific Software.

Jöreskog, K. & Sörbom, D. (1993). *New Features in Prelis 2*. Chicaco: Scientific Software.

- Jöreskog, K. & Sörbom, D. (1993). *Lisrel 8: Structural Equation Modelling with the Simplis Command Language*. Scientific Software International. Hillsdale: Erlbaum.
- Kahn, R. L. (1981). Work and health. Some psychosocial effects of advanced technology. In B. Gardell & G. Johansson (Eds.) *Working Life. A social Science Contribution to Work Reform*. Chishester: Wiley.
- Kalimo, R. (1980). Stress in work. Conceptual analysis and a study in prison personnel. *Scandinavian Journal of Work, Environment and Health*, **6**, suppl. 3.
- Kalimo, R. (1985). Psykkiset ja epämääräiset somaattiset oireet työterveysongelmissa. *Työterveyslaitoksen Tutkimuksia*, **3**, 367-384.
- Kalimo, R. (1987). Stressi ja psyykinen kuormitus työelämässä. Teoksessa K. Lindström & R. Kalimo (Toim.). *Työpsykologia, terveys ja työelämän laatu*. Helsinki: Työterveyslaitos.
- Kalimo, R. (1994). Terveysten edistäminen työpaikalla. Teoksessa K. Lindström (Toim.). *Terve työyhteisö: Kehittämisen malleja ja menetelmiä*. Helsinki: Työterveyslaitos.
- Kalimo, R. & Toppinen, S. (1993). Työolot, yksilölliset tekijät ja koettu terveys. Teoksessa R. Kalimo, M. Olkkonen & S. Toppinen (Toim.). *Ihminen kehittyvässä tuotannossa: Tutkimus- ja kehityshanke teollisuudessa. Työ ja Ihminen*, lisänumero 4. Helsinki: Työterveyslaitos.
- Kaplan, M. L. & Kaplan, M. R. (1991). The self-organization of human psychological functioning. *Behavioral Science*, **36**, 161-178.
- Karasek, R. A. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly*, **24**, 285-307.
- Karasek, R. A. (1981). Job socialization and job strain: The implications of two related psychosocial mechanisms for job design. In B. Gardell & G. Johansson (Eds.). *Working life. A Social Science Contribution to Work Reform*. Chichester: Wiley.
- Karasek, R., & Theorell, T. (1990). *Healthy Work, Stress, Productivity and the Reconstruction of Working life*. New York: Basic Books.

- Karasek, R. A., Triants, K. P. & Chaudhry, S. S. (1982). Co-worker and supervisor support as moderators of associations between task characteristics and mental strain. *Journal of Occupational Behaviour*, **3**, 181-200.
- Kasl, S. V. (1989). An epidemiological perspective on the role of control in health. In S. L. Sauter, J. J. Hurrell, Jr., & C. L. Cooper (Eds.). *Job Control and Worker Health*. New York: Wiley.
- Kasl, S. V. (1996). The influence of the work environment on cardiovascular health: A historical, conceptual and methodological perspective. *Journal of Occupational Health Psychology*, **1**, 42-56.
- Kaufman, I., Pornschlegel, H. & Udris, I. (1982). Arbeitsbelastung und Beanspruchung. In L. Zimmerman (Hrsg.). *Humane Arbeit -Leitfaden für Arbeitnehmer*. Band 5: Belastung und Stress bei der Arbeit. Reinbeck: Rowohlt.
- Kaukanen, M. (1995). *Työsuojelutarkastajan työn piirteet ja työssä koettu pätevyys*. Pro gradu-tutkielma, moniste. Tampere 1995 : Tampereen yliopisto.
- Kauppinen-Toropainen, K. (1987). Ainokaiset työyhteisössä. Haastattelututkimus työn sukupuolenmukaisen eriytymisen vaikutuksista työtyytyväisyyteen, psyykkiseen uupumukseen ja stressiin. *Työ ja Ihminen. Työympäristötutkimuksen aikakauskirja*, lisännumero 1/87. Helsinki: Työterveyslaitos.
- Kernis, M. H., Grannemann, B. D. & Barckay, L. C. (1989). Stability and level of self-esteem as predictors of anger arousal and hostility. *Journal of Personality and Social Psychology*, **56**, 1013-1023.
- Keskinen, E. (1982). *Inhimillinen tekijä liikenteessä*. Psykologian tutkimuksia 59. Turku: Turun yliopisto.
- Keskinen, S. (1990). *Päiväkotihenkilöstön sisäisten mallien yhteys työviihtyvyyteen, työn rasittavuuteen ja ammatti-identiteettiin*. Turun yliopiston julkaisuja, Sarja C:80. Turku: Turun yliopisto.
- Khandelwal, P. & Aleem, S. (1990). A study of factor structure of the job characteristics model. *Psychological Studies*, **35**, 124-128.

Kilman, R. H. & Herden, R. P. (1976). Towards a systematic methodology for evaluating the impact of interventions on organizational effectiveness. *Academy of Management Review*, **1**, 87-89.

Kivimäki, M. (1996). Stress and personality factors: Specifications of the role of test anxiety, private self-consciousness, type A behaviour pattern, and self-esteem in the relationship between stressors and stress reactions. *People and Work*, Res. rep 9. Helsinki: Finnish Institute of Occupational Health.

Kivimäki, M. & Kalimo, R. (1996). Self-esteem and the occupational stress process: Testing two alternative models in a sample of blue-collar workers. *Journal of Occupational Health Psychology*, **1**, 187-196.

Kivimäki, M. & Lindström, K. (1994). Osallistuminen päätöksentekoon sairaalaosastolla. *Työ ja Ihminen*, **8**, 267-274.

Kobasa, S. C. (1979). Stressful life events, personality and health: An inquiry into hardiness. *Journal of Personality and Social Psychology*, **37**, 1-11.

Kohn, M. L. & Schooler, C. (Eds.) (1983). *Work and Personality*. Norwood: Alex Publishing.

Korhonen, M. (1989). *Analysis of Variance and Covariance. Survo 84C Contributions*. Department of Statistics, Helsinki: Helsinki University.

Kostama, H., Järvenpää, E., & Teikari, V. (1992). *Lyhytkestoisen psyykkisen kuormittuneisuuden tutkiminen työpaikalla. Ohjeita BMS- ja EZ-menetelmien käyttäjälle*. Teollisuustalous ja työpsykologia. Raportti no 141. Espoo: Helsingin teknillinen korkeakoulu.

Kouzis, A. C. & Eaton, W. W. (1994). Emotional disability days: Prevalence and predictors. *American Journal of Public Health*, **84**, 1304-1307.

Kristensen, T. S. (1995). The demand-control-support model: Methodological challenges for future research. *Stress Medicine*, **11**, 17-26.

Kulik, C. T., Oldham, G. R. & Langner, P. H. (1988). Measurement of job characteristics: Comparison of the original and revised Job Diagnostic Survey. *Journal of Applied Psychology*, **73**, 462-466.

Lazarus, R. S. (1966). *Psychosocial Stress and the Coping Process*. New York: McGraw-Hill.

Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, **44**, 1-21.

Leoford, G. E. (J.r) & Mohrman, S. (1993). Self-design for high involvement: A large-scale organizational change. *Human Relations*, **46**, 143-173.

Leppänen, A. (1993). Työn käsitteellisen hallinnan ja hyvinvoinnin yhteydet ja kehittyminen paperinvalmistuksessa. *Työ ja Ihminen*, **7**, lisänumero 6. Helsinki: Työterveyslaitos.

Levi, L. (Ed.) (1971). *Society, Stress and Disease: The Psychological Environment and Psychosomatic Diseases*. vol 1. London: Oxford University Press.

Levi, L. (Ed.) (1972). Stress and distress in response to psychosocial stimuli. *Acta Medica Scandinavica*, **191**, Suppl. 528.

Levi, L. (1994). Work, worker and well-being: An overview. Special Issue: A healthier work environment. *Work and Stress*, **8**, 79-83.

Levin, I. & Stokes, J. P. (1989). Dispositional approach to job satisfaction: Role of negative affectivity. *Journal of Applied Psychology*, **74**, 752-758.

Lindström, K. (1994a). Työyhteisöjen kehittämisen suuntaukset: Terve yksilö ja terve työyhteisö. Teoksessa K. Lindström (Toim.). *Terve työyhteisö - kehittämisen malleja ja menetelmiä*. Helsinki: Työterveyslaitos.

Lindström, K. (1994b). Työyhteisön kehittämisen suunnittelu ja toteutus. Teoksessa K. Lindström (Toim.). *Terve työyhteisö-kehittämisen malleja ja menetelmiä*. Helsinki: Työterveyslaitos.

Lindström K. (1994c). Työyhteisön kehittämisen arviointi. Teoksessa K. Lindström (Toim.). *Terve työyhteisö-kehittämisen malleja ja menetelmiä*. Helsinki: Työterveyslaitos.

Lindström, K. (1995). Työyhteisön työkyvyn arviointi. Teoksessa E. Matikainen, T. Aro, R. Kalimo, J. Ilmarinen, & I. Torstila (Toim.). *Hyvä työkyky. Työkyvyn ylläpidon malleja ja keinoja*. Helsinki: Työterveyslaitos & Ilmarinen.

- Lindström, K. (1997). Assessing and promoting healthy organizations. In P. Seppälä, T. Luopajarvi, C.-H. Nygård & M. Mattila (Eds.). *Organizational Design and Management*. Proceedings of the 13th Triennial Congress of the International Ergonomics Association, Tampere, Finland. (Vol 1). Helsinki: Finnish Institute of Occupational Health.
- Locke, E. A. (1976). The Nature and causes of job satisfaction. In M. D. Dunnette (Ed.). *Handbook of Industrial and Organizational Psychology*. Chicago: Rand McNally.
- Mannfors, J-E., Hallila, E., Palko, J. & Pohjolainen, L. (1988). *SAS-käyttäjän käsikirja*. Otaniemi: Suomen SAS-käyttäjien yhdistys ry.
- Marshak, R. J. (1993). Managing the metaphors of change. *Organisational Dynamics*, **22**, 44-56.
- Miller, D. & Droge, C. (1986). Psychological and traditional determinants of structure. *Administrative Science Quarterly*, **31**, 539-560.
- Munn, E. K., Barber, C. E. & Fritz, J. J. (1996). Factors affecting the professional well-being of child life specialists. *Children's Health Care Journal*, **25**, 71-91.
- Murphy, J. (1992). Entrepreneurial organisations and self-evaluation: Learning to improve effectiveness through SEER. *Leadership and Organisation Development Journal*, **13**, 28-39.
- Murphy, R. L. (1996). Stress management in work settings: A Critical review of the research literature. *American Journal of Health Promotion*, **11**, 112-135.
- Murphy, L. R., Hurrell, J. J. (Jr.), Sauter, S. L. & Keita, C. P. (Eds.) (1995). *Job Stress Interventions*. Washington D C: American Psychological Association.
- Murphy, L. R. & Lim S-Y. (1997). Characteristics of healthy work organizations. In P. Seppälä, T. Luopajarvi, C.-H. Nygård & M. Mattila (Eds.). *Organizational Design and Management*. Proceedings of the 13th Triennial Congress of the International Ergonomics Association, 1997 Tampere, Finland, Vol 1. Helsinki: Finnish Institute of Occupational Health.
- Murto, K. (1992). *Prosessin johtaminen. Kohti prosessikeskeistä työyhteisön kehittämistä*. Saarijärvi: Jyväskylän Koulutuskeskus Oy.

- Mustonen, S. (1992). *Survo. An Integrated Environment for Statistical Computing and Related Areas*. Helsinki: Survo Systems.
- Naschold, F. (1993). Experiences in restructuring work organization. In J. Thurman et al.. *On Business and Work*. Geneva: ILO.
- Neisser, U. (1982). *Kognitio ja todellisuus*. Alkuperäisteos: *Cognition and Reality, Principles and Implications of Cognitive Psychology*. Suom. Helena Jahnukainen. Espoo: Weilin+Göös.
- Niemelä, E. & Teikari, V. (1984). *Työn psyykkinen kuormittavuus - käsitteet, malli ja mittaaminen*. Teollisuustalouden ja työpsykologian laboratoriot report no 82/1984. Otaniemi: Helsingin teknillinen korkeakoulu.
- Nitsch, J. R. (1971). *Theorie und Skalierung der Ermüdung. Eine Studie zum Beanspruchungsproblem*. Berlin: Technische Universität.
- Nitsch, J. R. (1974). Die hierarchische Struktur des Eigenzustandes - ein Approximationsversuch mit Hilfe der Binärstrukturanalyse (BISTRAN). *Diagnostika*, **20**, 147-164.
- Nitsch, J. R. (1976). Die Eigenzustandsskala (EZ-Skala)- Ein Verfahren zur hierarchisch-mehrdimensionalen Befindlichkeitskalierung. In J. R. Nitsch & I. Udris (Eds.). *Beanspruchung im Sport. Beiträge zur psychologischen Analyse sportlicher Leistungssituation*. Wiesbaden: Schriften reiche Training und Beanspruchung,
- Nowack, K. M. (1991). Psychosocial predictors of health status. *Work and Stress*, **5**, 117-131.
- Ojanen, M. (1988). *Työ- ja hoitoilmapiiri pitkäaikaispotilaiden hoitoyksiköissä*. Psychiatria Fennican julkaisuja, rep. no 83. Helsinki: Psykiatrian Tutkimussäätiö.
- Parker, S. K., Chmiel, N. & Wall, T. D. (1997). Work characteristics and employee well-being within a context of strategic down sizing. *Journal of Occupational Health Psychology*, **2**, 289-303.
- Raskin, R., Novacek, J. & Hogan, R. (1991). Narcissism, self-esteem and defensive self-enhancement. *Journal of Personality*, **59**, 20-38.
- Rector, N. A. & Roger, D. (1996). Cognitive style and well-being: A prospective examination. *Personality and Individual Differences*, **21**, 663-674.

- Renn, R. W. & Vandenberg, R. J. (1995). The critical psychological states: An underrepresented component in job characteristics model research. *Journal of Management*, **21**, 279-303.
- Revicki, D. A. & Gershon, R. R. M. (1996). Work related stress and psychological distress in emergency medical technicians. *Journal of Occupational Health Psychology*, **1**, 391-396.
- Rosenberg, M. (1962). The association between self-esteem and anxiety. *Journal of Psychiatric Research*, **1**, 135-152.
- Rosenberg, M. (1979). *Conceiving the Self*. Malibar: Krieger.
- Saarela, K. L. (1991). *Promoting Safety in Industry: Focus on Informational Campaigns and Participative Programs*. Helsinki: Finnish Institute of Occupational Health and Helsinki University of Technology.
- Saari, S. & Majander, H. (1985). *Seurantatutkimus mielenterveyden kehittämisestä. Ulkoisten elämäntilanteiden välittymismallin tarkastelua*. Helsingin yliopiston psykologian laitoksen tutkimuksia nro 2. Helsinki: Helsingin yliopisto.
- Sashkin, M. (1984). Participative management is an ethical imperative. *Organizational Dynamics*, **12**, 5-22.
- Schaubroeck, J., Ganster, D. C. & Kremmer, B. (1996). Does trait affect promote job attitude stability? *Journal of Organizational Behavior*, **17**, 191-196.
- Schein, E. A. (1985). *Organizational Culture and Leadership*. San Francisco: Jossey-Bass.
- Schein, E. H. (1993). On dialogue, culture and organizational learning. *Organizational Dynamics*, **22**, 40-51.
- Schneider, B. (1987). E=f (P,B): The road to a radical approach to person-environment fit. *Journal of Vocational Behavior*, **31**, 353-361.
- Schonfeld, I. S. (1996). Relation of negative affectivity to self-reports of job stressors and psychological outcomes. *Journal of Occupational Health Psychology*, **1**, 397-412.

Schwartz, J. E. Pickering, T. G. & Landsbergis, P. A. (1996). Work-related stress and blood pressure: Current theoretical models and considerations from a behavioral medicine perspective. *Journal of Occupational Health Psychology*, **1**, 287-310.

Selye, H. (1956). *The Stress of Life*. New York: McGrawHill.

Selye, H. (Ed.) (1983). *Selye's Guide to Stress Research*. Vol I. New York: Reinhold.

Smith, K., Locke E. A. & Barry, D. (1990). Goal setting, planning and organizational performance: An experimental simulation. *Organizational Behaviour and Human Decision Processes*, **46**, 118-134.

Sosiaalivaliokunnan mietintö no 13 (1986). *Hallituksen esityksestä laeiksi työturvallisuuslain ja eräiden siihen liittyvien lakien muuttamisesta, lakialoitteesta laiksi työsuojelun valvonnasta annetun lain muuttamisesta ja lakialoitteesta laeiksi työturvallisuuslain 9§:n ja työsuojelun valvonnasta annetun lain 26 §:n muuttamisesta*. 1986 vp. SoVM n:o 13 -esitys n:o 81/1985 vp. ja lakialoitteet n:ot 18/1985 vp. ja 118/1985 vp.

Spangler, W. D. (1989). Single source response bias in the Job Diagnostic Survey. *Psychological Reports*, **65**, 531-546.

Sterling, P. & Allostasis, E. J. (1988). A New paradigm to explain arousal pathology. In S. Fisher & J. Reason (Eds.). *Handbook of Life, Stress, Cognition and Health*. Chichester: Wiley.

Taber, T. D. & Taylor, E. (1990). A review and evaluation of the psychometric properties of the Job Diagnostic Survey. *Personnel Psychology*, **43**, 467-500.

Theorell, T. & Karasek, R. A. (1996). Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology*, **1**, 9-26.

Thompson, D. E. (1971). Favourable self-perception, perceived supervisory style and job satisfaction. *Journal of Applied Psychology*, **55**, 348-352.

Tice, D. M. & Baumeister, R. F. (1990). Self-esteem, self-handicapping and self-presentation: The strategy of inadequate practice. *Journal of Personality*, **58**, 444-464.

Ting, Y. (1997). Determinants of job satisfaction of federal government employees. *Public Personnel Management*, **26**, 313-334.

Turner, A. N. & Lawrence, P. R. (1965). *Industrial Jobs and the Worker*. Harvard University Graduate School of Business Administration. Boston: Harvard University.

Työturvallisuuslaki (1994). *Ohjeita ja neuvoja työturvallisuuslain (299/58...509/93) soveltamisesta, 35. uudistettu painos*. Helsinki: Työterveyslaitos.

Vahtera, J. (1993). Työn hallinta, sosiaalinen tuki ja terveys. *Työ ja Ihminen*: lisänumero 1. Helsinki: Työterveyslaitos.

Valtioneuvoston päätös (1994). Työnantajan velvollisuudeksi säädetyistä sekä yrittäjän ja muun omaa työtään tekevän työterveyshuollosta. (Vnp 27.10.1994/950). Teoksessa R. Luhtanen (Toim.). *Työpaikan lakikirja*. Helsinki: Edita.

Varonen, Unto (1997). *Tapaturmien torjunta mekaanisessa metsäteollisuudessa*. Tampere: Tampereen teknillinen korkeakoulu.

Vartiainen, M. (1989). *JDS - Job Diagnostic Survey - katsaus menetelmään*. Teollisuutalous ja työpsykologia. Raportti no 112. Otaniemi: Helsingin teknillinen korkeakoulu.

Vartiainen, M. (1990). Työn arviointi JDS-kyselyn avulla. *Hallinnon Tutkimus*, **9**, 187-198.

Virkkunen, J. (1995). *Työpaikkatarkastuksen ristiriidat ja niiden ylittämisen mahdollisuudet. Tutkimus keskusteluun perustuvan työn välineistä ja tuloksellisuudesta*. Työpoliittinen tutkimus no 123. Helsinki: Työministeriö.

Warr, P. & Wall, T. (1975). *Work and Well-Being*. London 1975: Penguin Books.

Weisboard, M. R. (1978). *Organizational Diagnosis: A workbook of Theory and Practice*. Reading: Allison & Wesley.

Westlander, G. (1993). *Socialpsykologi*. Göteborg: Akademiförlaget.

White, R. (1959). Motivation reconsidered: the concept of competence. *Psychological Review*, **66**, 297-333.

Wiedenfeld, S-A., O'Leary, A., Bandura, A., Brown, S. et al. (1990). Impact of perceived self-efficacy in coping with stressors on components of the immune systems. *Journal of Personality and Social Psychology*, **59**, 1082-1094.

Wilson, J. R. (1994). Developing ergonomics: The key to ergonomics management programmes. *Ergonomics*, **37**, 579-594.

Winbust, J. A. M., Buunk, B. P. & Marcelissen, F. H. G. (1988). Social support and stress; perspectives and processes. In S. Fisher, J. Reason (Eds.). *Handbook of Life Stress, Cognition and Health*. Chichester: Wiley.

Woodworth, R. S. (1958). *Dynamics of Behaviour*. New York: Holt.

World Health Organization (1986). Constitution of the World Health Organization. In WHO (Ed.) *Basic Documents*, 36th ed.. Geneva: WHO.

Zaccaro, S. J. & Store, E. F. (1988). Incremental validity of empirically based measure of job characteristics. *Journal of Applied Psychology*, **73**, 245-252.

Original Publications

- I Waris, K. (1994). Job Diagnostic Survey (JDS) -menetelmän luotettavuus työn ydinpiirteiden arvioinnissa. Reliability of the Job Diagnostic Survey (JDS) in evaluating the core traits of work. *Työ ja Ihminen*, **3**, 183-195.
- II Waris, K. (1995). EZ (Eigenzustand)-menetelmä kuormittuneisuuden mittarina: menetelmän luotettavuuden arviointia. The EZ (Eigenzustand) method as an assessment instrument of work load: Evaluating the validity and reliability of the method. *Työ ja Ihminen*, **3**, 189-197.
- III Waris, K. (1996). Työolojen omaehtoinen kehittäminen ja henkinen kuormittuneisuus. Organisational self-improvement and mental work load. *Työ ja Ihminen*, **3**, 179-197.
- IV Waris, K. (1997). Toimiva työyhteisö ja sopivasti haasteellinen työ lisäävät motivaatiota ja toimintakykyä sekä parantavat itsearvostusta. A well-functioning organisation and properly demanding work increase motivation, decrease mental strain, and improve self-esteem. *Työ ja Ihminen*, **2**, 94-114.